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ABSTRACT

In order to create a Statewide evaluation system for schools offering occupational education, behavioral objectives of various occupational programs were developed A total systems approach to education was thus possible with behavioral objectives as the basic component. Thirty-six participating secondary schools and community colleges in Massachusetts and New York generated over ten thousand raw objectives--RAWOBs--during the 1970-72 project. These were consolidated into 724 synthesized objectives--SYNOBs--designed to provide a means by which schools could select objectives on which their students would be tested and by which the schools and teachers could follow their own preferences in the processes of instruction. Next, a bank of test items was constructed reflecting the common objectives across schools and the individual variations within schools. The results of the tests make possible the continuous evaluation of the effectiveness of methods and goals of teaching in a classroom, school, local system, or State. In the final report, descriptive and explanatory material is interspersed with the documents used in the project. A glossary and bibliography are appended. (MS)

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FINAL REPORT

Evaluation Service Center For Occupational Education

Submitted To:

COMMONWEALTH OF MASSACHUSETTS

Department of Education
Division of Occupational Education
Research Coordinating Unit
Boston, Massachusetts

STATE OF NEW YORK

Department of Education
Bureau of Occupational Education
Research Coordinating Unit
Albany, New York

From

THE CENTER FOR OCCUPATIONAL EDUCATION
SCHOOL OF EDUCATION
UNIVERSITY OF MASSACHUSETTS

June 1972

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FINAL REPORT

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

TO

COMMONWEALTH OF MASSACHUSETTS

Department of Education
Division of Occupational Education
Research Coordinating Unit
Boston, Massachusetts

STATE OF NEW YORK

Department of Education
Bureau of Occupational Education
Research Coordinating Unit
Albany, New York

FROM

THE CENTER FOR OCCUPATIONAL EDUCATION
SCHOOL OF EDUCATION
UNIVERSITY OF MASSACHUSETTS

JUNE 1972

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I - Performance Test for Auto Mechanics
by Jim C. Fortune

J - Woodworking Objective and Test Item Bank
by Ronald K. Hambleton and Francis Olszewski

K - Blocks and Units: Secondary and Post-Secondary

L - Writing Behavioral Objectives for Occupational Education
A Programmed Text

M - Technical Report Number 1 (March 1971)

N - Instruction Manual: Synthesized Objective Package

O - SYNOB Package [Matrix and Printouts]: Auto Mechanics

P - SYNOB Package [Matrix and Printouts]: Industrial Electronics

Q - SYNOB Package [Matrix and Printouts]: Machine Shop

R - SYNOB Package [Matrix and Printouts]: Millwork and Cabinetmaking

S - Behavioral Objectives Training Package

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PROJECT SPONSORS

MASSACHUSETTS

Charles H. Buzzell
Associate Commissioner for
Occupational Education

Ronald J. Saris, Director
Research Coordinating Unit
Division of Occupational Education

William G. Conroy, Jr.
Former Director, Research
Coordinating Unit.
Director, Massachusetts
Information System for
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Howard P. Alvir
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1971-72

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John J. Iacobucci
Coordinator of
Secondary Programs

Roshan Billimoria
Research Associate

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Research Assistant

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CENTER FOR EDUCATIONAL RESEARCH

ESCOE TEST-DEVELOPMENT PERSONNEL

Jimmie Fortune
Professor
Director, Test Development

Ronald K. Hambleton
Associate Professor

William P. Gorth
Associate Professor

Hariharan Swaminathan
Assistant Professor

LOCAL EDUCATIONAL AGENCIES (LEAs) SERVED BY ESCOE

	MASSACHUSETTS		NEW YORK	
	1970-71	1971-72	1970-71	1971-72
Secondary	9	9	7	4
Post-secondary	3	2	3	11
Totals	12	11	10	15

Over 10,000 Behavioral Objectives are in the ESCOE data bank as of June 1972.

Pages viii through xi list the LEA's and LEA personnel that participated in some way in the ESCOE project.

LOCAL EDUCATIONAL AGENCIES

MASSACHUSETTS

BLUE HILLS REGIONAL VOCATIONAL
TECHNICAL HIGH SCHOOL
100 Randolph Street
Canton, Massachusetts, 02021
Tel. 617: 828-5800
1970-71
Admin: William Dwyer
Facil: Bradley Sears
Arthur Vuillemier

BOSTON TRADE HIGH SCHOOL
550 Parker Street
Roxbury, Massachusetts, 02120
Tel. 617: 445-6200
1970-71, 1971-72
Admin: Jeffrey Keating
Facil: Habib Deratany
Thomas Lividoti

BRISTOL COMMUNITY COLLEGE
Fall River, Massachusetts, 02723
Tel. 617: 678-2811
1970-71
Admin: Jack Hudraer
Facil: Anthony Mercurio

DIMAN REGIONAL VOCATIONAL
TECHNICAL HIGH SCHOOL
Fall River, Massachusetts, 02723
Tel. 617: 678-2891
1970-71, 1971-72
Admin: John Harrington
Facil: Russ Booth
Henri Pare

GREATER LAWRENCE REGIONAL
VOCATIONAL HIGH SCHOOL
57 River Road
Andover, Massachusetts, 01810
Tel. 617: 686-0194
1970-71, 1971-72
Admin: James Booth
Facil: John Iacobucci
Norman Martin
Wilfred Savoie

LAWRENCE HIGH SCHOOL
Falmouth, Massachusetts, 02540
Tel. 617: 548-0415
1970-71
Admin: Harry Merson
Facil: Bernie Holmes

MASSASOIT COMMUNITY COLLEGE
Howard Street
West Bridgewater, Massachusetts, 02379
Tel. 617: 588-9100, 9101
1970-71, 1971-72
Admin: Michael Barden
Facil: Wilfred Charette
Sue Endee
Ed Lemay

NASHOBA VALLEY REGIONAL
HIGH SCHOOL
Route 110
Westford, Massachusetts, 01886
Tel. 617: 692-4711
1971-72
Admin: Thomas Lafionitis
Facil: David McLaughlin

NEWTON TECHNICAL HIGH SCHOOL
40 Elm Road
Newtonville, Massachusetts, 02160
Tel. 617: 332-1880
1971-72
Admin: Orrin Braun
Daniel Malia
Facil: Richard Burke
Patrick Nicholas
Luciano Visco

NORTHEAST METROPOLITAN REGIONAL
VOCATIONAL HIGH SCHOOL
Box 238
Wakefield, Massachusetts, 01880
Tel. 617: 246-0810
1970-71, 1971-72
Admin: Douglas Tilley
Facil: Henry Corcoran
Carleton Kennerson
Clifford Perry

MASSACHUSETTS (continued)

NORTH SHORE COMMUNITY COLLEGE
3 Essex Street
Beverly, Massachusetts, 01915
Tel. 617: 927-6850
1971-72
Admin: Paul Frydrych
Facil: Paul Gillette

QUINCY VOCATIONAL TECHNICAL HIGH SCHOOL
107 Woodward Avenue
Quincy, Massachusetts, 02169
Tel. 617: 671-0100
1970-71, 1971-72
Admin: Larry Babin
Maurice Daly
Facil: Robert Breagy
Paul Milward
Joseph Nicastro
Glen Neifing

SHAWSHEEN VALLEY TECHNICAL HIGH SCHOOL
100 Cook Street
Billerica, Massachusetts, 01866
Tel. 617: 667-2111
1971-72
Admin: Benjamin Wolk
Facil: Fred Taber

SMITH VOCATIONAL HIGH SCHOOL
80 Locust Street
Northampton, Massachusetts, 01060
Tel. 413: 584-5759
1970-71
Admin: Stanley Dowgert
Facil: John Filipek
Edward Vandoloski

SOUTHEAST REGIONAL VOCATIONAL HIGH SCHOOL
250 Foundry Street
Easton, Massachusetts, 02375
Tel. 617: 238-4371
1970-71, 1971-72
Admin: Ralph Bumpus
Facil: Almon Miller
Michael Murphy
Donald Drew
Peter Kadzis

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE
Armory Square
Springfield, Massachusetts, 01109
Tel. 413: 781-6470
1970-71
Admin: Edmund Garvey
Facil: Robert Geitz
Stanley Cummings

NEW YORK

ADIRONDACK COMMUNITY COLLEGE
Glen Falls, New York, 12801
Tel. 518: 793-4491
1971-72
Admin: Emerson Hibbard
Facil: C. Elliott Dunn
Paul Gallipeo
Bror Wahlquist
Ronald Williams

AGRICULTURAL AND TECHNICAL
COLLEGE AT DELHI
Delhi, New York, 13753
Tel. 607: 746-4111
1971-72
Admin: B. Klare Sommers
Facil: Ronald Brach

BRONX COMMUNITY COLLEGE
120 E. 184th Street
Bronx, New York, 10468
Tel. 212: 960-8793
1971-72
Admin: Richard Donovan
Facil: Violet Katz

BUFFALO PUBLIC SCHOOLS
816 City Hall, 65 Niagra Square
Buffalo, New York, 14202
Tel. 716: 842-4646
1970-71
Admin: Joseph Schmidle
Facil: James Peck

CORNING COMMUNITY COLLEGE
Corning, New York, 14830
Tel. 607: 962-9243
1971-72
Admin: Robert Frederick, Jr.
Robert Chapman
Facil: Emory Bauer
Florence Healy
Raymond Welch

CUNY-ROC
460 West 42nd Street
New York, New York, 10038
Tel. 212: 868-3000
1970-71, 1971-72
Admin: George Quarles
Facil: Claudia Loftis
Alfred Dennis

DUTCHESS COMMUNITY COLLEGE
Pendall Road
Poughkeepsie, New York, 12601
Tel. 914: 471-4500
1971-72
Admin: Lawrence Monaco
Facil: John Demenkoff
Robert Dolansky

ERIE I BOCES
99 Aero Drive
Buffalo, New York, 14225
Tel. 716: 634-6800
1970-71
Admin: Donald Dayer
Facil: Donald Dayer

HUDSON VALLEY COMMUNITY COLLEGE
80 Vandenberg Avenue
Troy, New York, 12180
Tel. 518: 283-1100
1970-71, 1971-72
Admin: James Fitzgibbons
Reuben Merchant
Facil: Walter Long
Eugene Stalica

KINGSBOROUGH COMMUNITY COLLEGE
Oriental Avenue
Brooklyn, New York, 11211
Tel. 212: 769-9200
1970-71
Admin: Isabelle Krey
Facil: Isabelle Krey

NEW YORK (continued)

LA GUARDIA COMMUNITY COLLEGE
31-10 Thompson Avenue
Long Island, New York, 11101
Tel. 212: 937-9200
1971-72
Admin: Harry Heinaman
Freeman Sleeper
Facil: Dorrie Williams

NASSAU COUNTY BOCES
125 Jericho Turnpike
Jericho, New York, 11753
Tel: 516: 997-8700
1970-71, 1971-72
Admin: Frank Woolf
Facil: Richard Kresse
William Steinberg
Barbara Field
Jerry Havlik
Bertram Wallace

NEW YORK CITY COMMUNITY COLLEGE
300 Jay Street
Brooklyn, New York, 11201
Tel. 212: 643-5015
1970-71, 1971-72
Admin: Mario Iraggi
Stanley Brodsky
Facil: Sid Avner
Carl High

NORTH HIGH SCHOOL
East Frederick Street
Binghampton, New York, 13901
Tel. 607: 726-2466
1970-71, 1971-72
Admin: John Warner
Facil: Billie Vest

ORANGE COUNTY COMMUNITY COLLEGE
115 South Street
Middletown, New York, 10940
Tel. 914: 363-1121
1971-72
Admin: Robert Greenman
Facil: Russell King
Herman Pollack

PUTNAM-WESTCHESTER COUNTY BOCES
845 Fox Meadow Road
Yorktown Heights, New York, 10598
Tel. 914: 245-2700
1970-71
Admin: Walter Goodman
Donald Bamford
Facil: Pat Carlo
Robert Wagner

ROCKLAND COMMUNITY COLLEGE
145 College Road
Suffolk, New York, 01901
Tel. 914: 356-4650
1971-72
Admin: Seymour Eskow
Facil: Henry Weinstock

SUFFOLK III BOCES
LA Wilson Technological Center
Lindenhurst Annex
301 Hoffman Avenue
Lindenhurst, New York, 11757
Tel. 516: 586-0100
1970-71, 1971-72
Admin: John Grime
John Burke
Facil: Virgil Indelicato
Janet Moses

WESTCHESTER COMMUNITY COLLEGE
75 Grasslands Avenue
Valhalla, New York, 10595
Tel. 914: 946-1616
1971-72
Admin: Donald Mahoney
Facil: Frank Crowley

WILLIAMSVILLE CENTRAL SCHOOL DISTRICT
Williamsville, New York, 14221
Tel. 716: 634-5300
1970-71
Admin: Ralph Mauro
Facil: Ralph Mauro

PREFACE

This Final Report is written in fulfillment of a requirement in the contract between the University of Massachusetts and the States of Massachusetts and New York by which The Evaluation Service Center for Occupational Education was established. The writing and organization of the Report have been undertaken in the spirit of providing complete information about ESCOE and its products in an accurate and easily readable form.

Descriptive statements enclosed throughout this report are within a large block on the page.

Amherst, Massachusetts
June 1972

COPIES OF THIS FINAL REPORT ARE AVAILABLE

UPON REQUEST TO:

[in MASSACHUSETTS]

Massachusetts Department of Education
Director of Research Coordinating Unit
Division of Occupational Education
182 Tremont Street
Boston, Massachusetts 02111

[in NEW YORK]

New York State Department of Education
Director of Research Coordinating Unit
Bureau of Occupational Education Research
Albany, New York 12224

Information contained within this Report and the other products of The Evaluation Service Center for Occupational Education (1970-72) are in the public domain. Their widespread dissemination and use is encouraged by those who have been involved in and were responsible for this project.

-June 30, 1972-

PROJECT EVALUATIONS

An evaluation of the effects of training in writing behavioral objectives was carried out by Kathryn A. Hecht in cooperation with ESCOE. The study is entitled "An Empirical Testing of Popular Expectations Held for Teachers Who Have Written and Used Behavioral Objectives" (School of Education, University of Massachusetts, 1972). The study sought to empirically demonstrate popular beliefs concerning the benefits to teachers from the experience of writing and using behavioral objectives.

ESCOE facilitators (identified by the pseudonym "Project Information" in the study) were chosen as an objective-experienced sample and compared with a similar group of teachers from Massachusetts without such experience. The study will be available through Dissertation Abstracts, University Microfilms, Ann Arbor, Michigan.

There is also an over-all evaluation of the ESCOE project in process at the University of Massachusetts which will be available in the form of a doctoral dissertation from The Center for Occupational Education, School of Education by June 1973.

I

INTRODUCTION
BEHAVIORAL OBJECTIVES AND EVALUATION AT ESCOE

ESCOE PRODUCTS
(as of June 30, 1972)

RAW OBJECTIVES - 10,361

SYNTHESIZED OBJECTIVES - 724

CRITERION-REFERENCED TESTS - 4

TRAINING PROGRAM - Content, Methods, Materials

PROGRAMMED TEXT - A Self-Instruction Manual on Writing Behavioral Objectives

CONFERENCES - Training and Planning, for Facilitators and Administrators, 8

FIELD SERVICES & WORKSHOPS - On a Continuing Basis in the LEAs

PUBLICATIONS - Instructional and Reporting Documents, 5

BEHAVIORAL OBJECTIVES AND EVALUATION AT ESCOE

A behavioral objective is a statement of precisely what a student will be able to do at the conclusion of a particular sequence of instruction, including the conditions under which he must perform the task and the criteria used to determine whether or not the performance is mastered (learned). The following are examples of objectives, written by teachers and submitted to the ESCOE data bank.[1]

1. "Given the values of all elements in a transformer coupled circuit, the student will calculate a) the coefficient of coupling; b) the induced voltage in the secondary; c) the impedance reflected in both the primary and secondary at resonance, with 70% accuracy."[2]

2. "Given three negative stats and darkroom equipment, the student will produce one positive print having 3 separate tones, in one hour."[3]

To make possible an orderly approach to the description of a course of study, a content analysis must be completed. A course must be

---

[1]Underlined words in the objectives quoted here refer to the beginning of each of the three components of an objective: Conditions (Given), Performance (the student will), Extent(with, in).

[2]Category breakdown for this objective:

Field of Study: Technical
Major Group: Engineering Related Technology
Subgroup: Electrical Technology
Block: Resonant Circuit Theory
Unit: Coupled Circuits

[3]Category breakdown for this objective:

Field of Study: Trade & Industry
Major Group: Commercial Art Occupations
Subgroup: Commercial Art
Block: Design
Unit: Photography

broken down into logical "blocks" of learning. These "blocks" must then be broken down into smaller pieces or "units," from which behaviorally stated objectives can be derived. For example:

Course: Surveying I

Block: Transits

Units: 1. Setting up the instrument

2. Reading the horizontal circle

3. Reading stadia.

From these Units the actual teaching objectives are then constructed. The number of performance objectives derived from these Units will vary and could be one, two, three or twenty -- any number required to fully describe that Unit.

The progression from the writing of individual objectives to the process of evaluation is a complex one and involves several stages. After it was decided that the use of behavioral objectives would serve as the basis for the statewide evaluation system, the first step was to generate the objectives. Only when a large number of objectives had been written could the creation of evaluation procedures actually take place. Consequently, much of the ESCOE effort was directed towards constructing a system of instructional and support services within which individual teachers in schools offering occupational education would write objectives for ESCOE. Thirty-six secondary schools and community colleges in Massachusetts and New

York have participated in the project, 1970-72. Approximately eighty facilitators in these LEAs have directed over 1000 teachers in the writing of objectives.

Over ten thousand separate objectives in thirty-eight different Subgroups have been written by these teachers during the two years of the project. Naturally there was considerable near-duplication, as well as considerable diversity, in objectives written for the same tasks by different instructors in different LEAs. A large number of procedures can be involved in the task of "reading stadia" for instance, even though this task is essentially the same everywhere and the number of alternative procedures is finite.

Thus ESCOE found itself faced with the necessity of consolidating, for many tasks, a number of similar objectives into one objective that would incorporate within its basic demands the various methods and conditions which individual instructors had submitted as representative of their own students and teaching. These final objectives are called "synthesized objectives" -- SYNOBs -- and the alternative procedures within them are referred to as "form changes."

The process of synthesis also became necessary in order to take steps towards the ultimate goal of instituting a statewide evaluation system. The SYNOB was designed to provide both a means by which schools could select objectives on which their students would be

tested, and also by which these same schools and teachers could follow their own preferences in the processes of instruction.

The next step towards the creation of an evaluation procedure was the construction of tests from the collection of synthesized objectives. These tests reflect both the common objectives across schools and the individual variations within schools that are reflected in the form changes. A test in a year's course in Cabinetmaking and Millwork, for instance, is so constructed that a teacher will select from a range of test items in that occupational area, only those items that were actually taught as objectives in his class that year. A student in any class is tested only on objectives that he actually performed. Ordinarily there will be a sufficient number of common objectives among different LEAs that test results will be comparable among them.

The results of the tests -- in their totality and through item analysis -- will make possible the evaluation of the effectiveness of methods and goals of teaching in a classroom, in a school, in the local and statewide system of schools. Evaluation will, in effect, measure learning. If this process of evaluation is continual, as it is intended to be, intelligent and directed changes can be brought about in the educational systems. These changes have as their purpose the improvement of education for the sake of the student.

OCCUPATIONAL AREAS WITH OBJECTIVES IN DATA BANK

USOE CODE	OCCUPATIONAL PROGRAM
010000	Agriculture
030000	Business
040000	Distributive Educ.
050000	English Language Arts
070100	Dental
070200	Medical Laboratory Technology
070300	Nursing
080300	Physical Education
090000	Home Economics
110000	Mathematics (Calculus, General Math, Geometry)
130000	Natural Sciences
140100	Accounting & Computing
140200	Business Data Processing
140300	Filing, Office Machines, General Office Clerical Occupations
140600	Personnel, Training, & Related Occupations
140900	Typing & Related Occupations
150800	History
160104	Automotive Technology
160106	Civil Technology
160107	Electrical Technology
160108	Electronics Technology
160113	Mechanical Technology
160114	Metalurgical Technology
160117	Scientific Data Processing
170100	Air Conditioning-Cooling
170102	Air Conditioning-Heating
170201	Electrical Appliance Repair
170301	Automotive - Body and Fender
170302	Automotive Mechanics
173100	Small Engine Repair
170700	Commercial Art Occupations
171004	Masonry
171005	Painting & Decorating
171007	Plumbing & Pipefitting
171010	Roofing
171300	Drafting Occupations
171400	Electrical Occupations
171500	Electronics Occupations
171900	Graphic Arts Occupations
172302	Machine Shop
172305	Sheet Metal
172306	Welding & Cutting
172602	Cosmetology
172901	Baker
172902	Chef/Cook
172903	Meat Cutter
173300	Textile Production & Fabrication
173500	Upholstering
173601	Cabinetmaking & Millwork
171001	Carpentry

KEY TERMS
USED IN THIS REPORT

ESCOE	Evaluation Service Center for Occupational Education
BEHAVIORAL OBJECTIVE	Statement describing, in observable terms, what a student will be able to do after completing a prescribed unit of instruction
RAWOB	Raw objective; a behavioral objective before synthesis
SYNOB	Synthesized objective; raw objectives that are similar in performance combined into one statement
LEA	Local Educational Agency, a school or group of schools operating under one administrative body.

THE THREE COMPONENTS OF A BEHAVIORAL OBJECTIVE
DEFINITIONS AND EXAMPLES

CONDITIONS

The exact circumstances, e.g. materials and procedures (or restrictions on them), under which an objective is performed

Given the values of all elements in a transformer coupled circuit,

PERFORMANCE

The exact observable behavior a student who has mastered the requirements of the objective will manifest.

the student will calculate a) the coefficient of coupling; b) the induced voltage in the secondary; c) the impedance reflected in both the primary and secondary at resonance,

EXTENT

The criteria--quality, tolerances, accuracy, percentage of correct answers, etc.--used to measure the performance.

with 70% accuracy.

[This objective belongs to the subgroup Electrical Technology.]

CATEGORY BREAKDOWN: DEFINITIONS AND EXAMPLES

Every objective written for ESCOE has been classified according to this category breakdown for occupational programs. Objectives are written within a "Unit."

FIELD OF STUDY

Broadest category of occupational classification; e.g., Trade & Industry, Health Occupations, etc.

Technical

MAJOR GROUP

Classification of occupational programs within a Field of Study; e.g., within Health Occupations: Dental Services, Medical Services, Nursing, etc.

Engineering Technology

SUBGROUP

Occupational programs within a Major Group.

Civil Technology

BLOCK

Largest instructional segment within a Subgroup.

Elementary Surveying

MAJOR TOPIC

(Post-secondary only)

A division within a Block, created for the particular characteristics of post-secondary programs.

Taping

UNIT

Instructional segment within a Block or Major Topic.

Correction for long or short tape

The number of objectives written to completely describe a Unit may vary, depending on the tasks, skills, or operations necessary for mastery of the Unit. The performance of every task within the Unit must be stated in the objectives so that no task is untapped.

II

ESCOE: HISTORY AND OVERVIEW

OPERATIONAL GOALS OF ESCOE

TO DEVELOP A BANK OF BEHAVIORALLY-STATED OBJECTIVES IN SELECTED AREAS OF STUDY

TO TRAIN FACILITATORS AND TEACHERS IN PARTICIPATING LEAs TO DESCRIBE SELECTED AREAS OF THE CURRICULUM BY BEHAVIORAL OBJECTIVES

including training in

the rationale, uses, and implementation of objectives...

writing...

classifying...

editing...and

synthesis...

of BEHAVIORAL OBJECTIVES

TO DEVELOP A BANK OF TEST ITEMS AND PROCEDURES DIRECTLY RELATED TO OBJECTIVES IN THESE SELECTED AREAS OF STUDY

TO CREATE A COMPUTER INPUT AND FEEDBACK (RETRIEVAL) SYSTEM

TO DEVELOP A MODEL FOR SYNTHESIZING OBJECTIVES

TO CREATE A FEEDBACK LOOP BETWEEN THE LEAs AND ESCOE

ESCOE Guidelines and Approach

ESCOE GUIDELINES

ESCOE is a component of a statewide systems approach to meeting program evaluation needs in each state. The ESCOE product provides a data base for decision-making in education.

ESCOE is an information feedback system for curriculum design and modification, which helps to diagnose strengths and weaknesses of existing programs, and to evaluate content for relevance.

Program objectives are determined by LEAs, not prescribed by central authority. Program evaluation is responsive to differences within and between local instructional programs. Diversification viewed as the most promising route to program improvement.

ESCOE APPROACH

ESCOE is designed to act as a neutral agent to feed back program-evaluation information on a continuing basis to managers of occupational education on all levels within participating states.

It also provides an alternative to standardized testing by measuring program achievement in terms of locally stated objectives.

ESCOE utilizes the instructional and technical capabilities of experienced school personnel in operating the system.

The ESCOE product supplies data for increased accountability focused on student achievement at state and local levels, but not at the cost of local autonomy or sound educational practice.

SERVICE COMMITMENT WITH LOCAL EDUCATIONAL AGENCIES

Staff at The Evaluation Service Center for Occupational Education felt it important that the responsibilities and goals of both ESCOE and the LEAs be clearly stated and recognized by all involved with the project. This "Statement of Intent," as it was originally called, was written and disseminated in September of 1971.

ESCOE'S COMMITMENT

The Evaluation Service Center recognizes the necessity for improved and expanded services available to the LEAs. ESCOE's success depends upon the quantity and quality of the services it supplies. It is crucial that the ESCOE services are broadly based and readily available. The list of services that follows is subject to modification according to the needs of participating LEAs.

1. Conduct orientation conference for administrators of prospective LEAs and of state departments of education. Administrators of participating LEAs and state departments will be systematically informed of the progress of the project.

2. Conduct training conferences for facilitators in order to present the materials and expertise needed to develop ESCOE's system in the LEAs. Conduct other conferences as needed for dissemination and test administration. The expenses for such conferences, except for travel, will be borne by ESCOE.

3. Conduct initial teacher-training conferences in LEAs and follow-up workshops as necessary.

SERVICE COMMITMENT (continued)

4. Maintain frequent visits to LEAs by ESCOE field staff for the purpose of assisting teachers and facilitators in writing and selecting objectives and in completing the reporting forms.

5. Provide all forms and training materials necessary for full participation.

6. Maintain readily available communication (mail and telephone) between LEAs and ESCOE.

7. Maintain an editorial process to receive and feed back comments on reporting forms and other activities of LEAs.

8. Deliver computer printouts from data bank as requested by LEAs.

9. Develop and administer performance tests.

10. Feed back criterion-referenced test data as requested by LEAs.

11. Facilitators and teachers will <u>not</u> be paid by ESCOE for the services they provide within their LEAs. Occasionally ESCOE will utilize staff from participating LEAs for such tasks as synthesizing objectives and development of criterion test materials. In these cases, ESCOE will compensate the teacher directly from ESCOE consultant funds.

LEA'S COMMITMENT

From the experience gained during the first year of operation, it is clear that modification of the process for developing the ESCOE system in the LEAs is necessary. The conditions described here are derived from observations by the ESCOE field experiences and from

SERVICE COMMITMENT (continued)

statements submitted by LEA facilitators.

1. The primary condition for participation should be that the LEAs believe in the philosophy of the ESCOE project as stated in the Planning Document, namely, "that American society and youth are best served if program objectives for occupational education are selected by LEAs and not centrally prescribed by state departments." A belief in this philosophy and the realization that participation in the ESCOE project will involve the LEA instructional staff in describing their programs in clear, specific, measurable statements should convince the LEA administration that the fruits of the ESCOE effort will be worth the labor.

2. Each LEA must assign a minimum of two "facilitators" to act as coordinators within the LEA. The facilitators must attend all ESCOE training and dissemination conferences. They will learn the philosophy, operation, benefits, application, outcomes, etc. of the ESCOE system as well as how to write behavioral objectives. Their function will be to instruct and coordinate the writing and selection of behavioral objectives in their LEA, and also to coordinate the test administration along with the ESCOE staff. The number of facilitators above two should be contingent upon the structure and size of the LEA. If a BOCES LEA has three separate schools, then probably one facilitator in each school would work out well, whereas two facilitators in a regional or local vocational school might be best. Community colleges should have at least one facilitator at each campus if the buildings are at different locations.

3. Experience has shown us that in some situations administrators do not have the time for direct involvement with teachers in this task. Thus, we are recommending that the ideal team for facilitation of well-written behavioral objectives in the LEA be one teacher and one coordinator/supervisor/administrator or a combination thereof.

However, it is imperative that the facilitator be a patient and empathetic person who is willing to devote much time and effort to the assignment.

4. Released time for the facilitators and teachers has proved to be the most effective method for full participation. The time-availability factor varies greatly across schools, so no one formula could apply in all situations. A lighter teaching load throughout the year would seem appropriate for facilitators. The equivalent of one period per day should be adequate for this chore. Participating teachers must attend a minimum of four after-school meetings for training by facilitators and ESCOE staff. In addition, approximately five departmental-teacher meetings might be necessary to write and/or select objectives. Released time for teachers, if necessary, could be accomplished by the use of substitute teachers.

5. By either writing or selecting objectives, or both, each LEA must completely describe the subgroups taught in that LEA. This means that LEA instructors in these subjects will submit or select <u>all</u> the behavioral objectives in their instructional program, which means all grade levels and all Blocks and Units therein. All subjects in an occupational curriculum are welcome. Concentration (synthesis and test development) is limited by economic factors within the project budget; however, it is inherent in the ESCOE philosophy to have <u>all</u> occupational education program objectives developed to the highest degree possible and in as many dimensions as might be useful.

6. Objectives and other data must be submitted on the proper reporting form (original copy) in easily readable print, preferably typewritten. If typewritten objectives are not possible, then they are acceptable only in clear block-print. To emphasize the importance of legibility, it must be remembered that these objectives are

read by card-punch operators who usually are not the least bit familiar with the descriptive terminology before them.

7. Administrators must support facilitators in providing adequate meeting time, space, supplies, and ancillary services to facilitate well-written, completely representative objectives. Scheduling meetings with teachers and making clerical staff available are crucial adjuncts to the function of the facilitator.

8. Facilitators will assist teachers in submitting well-prepared reporting forms. This means reading and editing teachers' objectives and feeding them back to the teachers if problems exist. An objective should not be submitted to ESCOE except in acceptable form.

September 1971

ESCOE: INCEPTION OF THE PROJECT

ESCOE is the fruition of more than two years of planning and pilot efforts. The impetus, as well as the funding source, for the development of an information feedback system for vocational education (as it was originally called) came from federal legislative action calling for program evaluation. This mandate has been applied to almost all types of sponsored education, and was specifically formulated for occupational education in 1968, under the amendments to the Vocational Education Act of 1963.*

The Massachusetts Occupational Education Research Coordinating Unit chose to develop a systems approach to evaluation, to be based on program assessment, using locally derived behavioral objectives. It proposed a system that is based on current methodological principles but which has not been put to the test of practical usage in any area of education. The establishment of ESCOE was designed to test the feasibility of operationalizing a statewide systems approach to evaluation. The inclusion of New York as the second participating state in ESCOE increases the generalizability of the system by widening the variety of programs the system will accommodate. The Evaluation Service Center is a prototype designed for expansion within member states and to other states.

*Public Law 90-576, Amendments to the Vocational Education Act of 1963, states that the State Advisory Committee shall "evaluate vocational education programs, services, and activities assisted under this title and publish and distribute the results thereof: and prepare and submit an annual evaluation report...which (1) evaluates the effectiveness of vocational education programs, services, and activities carried out in the year under review...."

A CHRONOLOGICAL OVERVIEW OF ESCOE'S ACTIVITIES

SCHOOL YEAR I, 1970-71

In October 1970 the contract was signed by the states of Massachusetts and New York and the University of Massachusetts at Amherst establishing The Evaluation Service Center for Occupational Education until June 30, 1972. Ideas for such an agency had been discussed for two years, and already in September of 1970 administrators and facilitators from ten schools in each state had met with the Research Coordinating Unit Directors from the two states and with the Director of the Center for Occupational Education at the University to make specific plans for the project and a commitment to it.

In November 1970 the first facilitators' conference under the auspices of ESCOE itself was held in Amherst for the purpose of training the facilitators in the skills of writing behavioral objectives and in the procedures for transmitting those objectives to the ESCOE office. At this conference LEA personnel, ESCOE staff, and state department representatives established many of the operating procedures. Working Paper No. 1 (December 1970) followed up this conference with a detailed explanation of the classification and coding of objectives. In January 1971 a second conference was held to further develop the facilitators' skills in dealing with objectives and to make final plans for the coming year.

This month, January 1971, also marked the situating of The Evaluation Service Center in offices at 85 North Whitney Street in Amherst, Ma.

Facilitators had been trained in writing objectives at the first conference in November and at the January conference; the first order of business was to continue the training and advising of facilitators in their own LEAs and to support teachers who were writing objectives. One staff member traveled to the LEAs for this purpose two to three days a week during February, March, and April. At The Evaluation Service Center the system for reception and processing of objectives was further evolved and a computer system into which all objectives were to be stored was developed. Refinement of both the coding and computer system has been continual for the duration of the project.

With the increasing number of objectives in many different Subgroups it was decided that four Subgroups -- Machine Shop, Industrial Electronics, Millwork & Cabinetmaking, and Automotive Mechanics -- chosen because of the large student enrollment in each area would be used as a prototype for synthesis and test development. Input of objectives in all Subgroups was encouraged, however, and synthesis in twenty-two more Subgroups took place during the Spring of 1972. In March 1971 Technical Report No. 1 was published, superseding Working Paper No. 1 and elaborating reporting and classification procedures.

When concentrated attention was given to objectives in the four Subgroups to which ESCOE would devote its first-year efforts in synthesis, it became obvious that a further refinement of the course

classification schemes was necessary. For placing a particular Subgroup within a larger instructional phase, codes from the United States Office of Education had been used and found satisfactory. However, a breakdown of instructional phases within a Subgroup did not exist in the USOE codes, and instructors in the LEAs were classifying the objectives they wrote by schemes too dissimilar to be useful in dealing with large numbers of objectives. Accordingly, in May of 1971 two instructors in each of the first four Subgroup areas met with the ESCOE staff to devise, from their own knowledge of the fields and from suggested breakdowns sent in by the LEAs, a standardized Block and Unit breakdown. Writers of objectives were encouraged to use these breakdowns but were also advised to suggest modifications when those already in existence were not suitable for their needs. Since that time, Blocks and Units for a total of thirty-eight Subgroup areas have been devised and disseminated.

Also in May 1971 a Spring Dissemination Conference at Cape Cod was held to review the year's activities, to plan for the following school year, and to give facilitators computer printouts of the raw objectives written by their LEAs.

The next major phase of the ESCOE effort was the synthesis of objectives in the first four selected Subgroups. In July the ESCOE staff met with Dr. Jimmie Fortune who introduced them to the process of

synthesis, as developed by David Berliner, and then, briefly, with Dr. Berliner. Two facilitators from each of the four Subgroup areas were tapped to learn synthesis from the ESCOE staff and then to actually synthesize objectives in the four areas. These synthesized objectives were entered into the data bank in October and printouts were given to facilitators at the conferences in October and November, 1971.

The Expanded Planning Document for School Year 1971-72 was submitted by ESCOE to the Associate and Assistant Commissioners for Occupational Education in Massachusetts and New York, respectively. This document detailed plans for budget, staff, and scheduling for the fiscal year 1972. A successful effort was made to include a number of post-secondary schools in the project for its second year.

SCHOOL YEAR II

During the second school year of the ESCOE project, there were eleven participating LEAs, secondary and post-secondary, in Massachusetts and fifteen in New York. In September, two staff members were assigned primarily to field services for the LEAs, spending approximately three days a week at the LEAs and two in the ESCOE office in Amherst. The Administrators' Conference was held in this month, emphasizing planning and commitment for the school year.

The generation of synthesized objectives, now an important aspect of

ESCOE's efforts, required a complex system of feedback between ESCOE and the LEAs in order that the development of the tests might accurately reflect course content. The Instruction Manual: Synthesized Objective Package, published in October of 1971, was designed to make this process as efficient and uncomplicated as possible. In addition, A Behavioral Objective Training Package: For Facilitators, incorporating techniques of training developed by ESCOE, and reporting procedures, was designed particularly for the new facilitators who would be joining the project in the Fall of 1971. With minor revisions and changes, this publication was used as the primary instrument for training teachers in the LEAs to write objectives.

The Training Package was used at the First Year Facilitators' Conference in November and by both first- and second-year facilitators as a resource for training teachers in their LEAs. Second-year facilitators' attended a conference in October and received intensive training in principles and methods of synthesis. Transfer of the data bank to Massachusetts State Department of Education facilities took place during November. On February 23 and 24, 1972, mid-winter vacation for most LEAs, a major Synthesizers' Workshop was held to train facilitators and teachers in synthesis. From this time until the end of June synthesis was carried out in the individual LEAs by those who had volunteered to carry out this work. Two ESCOE staff members spent most of their time in the LEAs, giving advisory and refresher workshops in the writing and synthesis of objectives.

Field testing of machine shop tests was begun in March, as was the development of the Blocks and Units necessary for synthesis. A copy of the punched computer cards was transferred to the computer at Hudson Valley Community College during April. Plans for the writing of a programmed text in writing behavioral objectives were finalized during this month; the text was completed in June.

The Cabinetmaking & Millwork[1] test underwent field testing in May. Also in May, the Spring Dissemination Conference was held for all facilitators where the primary emphasis was on the future possibilities for the work ESCOE had begun. Two filmstrips, including audio tapes, were being developed for ESCOE and are expected to be finished soon. These filmstrips, about twelve minutes each, are introductory in nature, explaining the need for evaluation and goal clarification in education and the basic strategies of curriculum analysis using behavioral objectives. Three ESCOE staff members conducted a three-day workshop as part of a longer workshop in systems analysis for teachers at one of ESCOE's participating community colleges. The field staff also concentrated heavily on finalizing synthesis activities in the LEAs. The synthesized objectives will be entered into the data banks of each State Department of Education.

[1] In the section of this Report on testing, Cabinetmaking and Millwork is referred to as "Woodworking."

CHRONOLOGICAL OVERVIEW: THE FUTURE

Activities very similar to those of ESCOE, 1970-72, will be carried out at The Evaluation Service Center for Occupational Education to be based at Hudson Valley Community College in Troy, New York, from July 1, 1972, to June 30, 1973. A staff member from the present ESCOE will direct the new ESCOE full time and will have the assistance of one half-time professional staff person. The emphasis of this project will be on the implementation of behavioral objectives, in instruction and in testing, and on curriculum development. At the start of the project twenty-five teachers in three secondary and six post-secondary LEAs are committed to the project.

In Massachusetts development work on the statewide evaluation system, of which ESCOE was Phase I, will continue at the Management and Information System Project (MISOE). Further information may be obtained from the Division of Occupational Education, Massachusetts Department of Education, Winchester, Massachusetts 01890.

III

THE TRAINING PROCESS

THE ESCOE TRAINING PROCESS

INTRODUCTORY VIEW: OBJECTIVES, PROCESS, PRODUCT

OBJECTIVES

Train facilitators

Train teachers

Feedback of objectives to ESCOE

PROCESS

Conferences (for facilitators, in central locations)

On-site Introduction to ESCOE & Systems Approach (one hour in the LEAs)

Workshops in LEAs on writing behavioral objectives, synthesis, and procedures for submitting objectives

Objective Writing: by faculty in LEAs for their own courses

Raw Objective Dissemination: Printouts to LEAs on request

Training for and Development of Blocks and Units: by selected and volunteer subject area specialists (teachers, department heads, etc.)

Synthesis Workshop: two subject area specialists for each Subgroup to be synthesized

Writing of SYNOBS: by those who participated in the Synthesis Workshop

Dissemination of SYNOBS: to all LEAs

PRODUCT

80 facilitators trained

1000-1500 teachers trained

10,361 RAWOBs in 38 Subgroups produced

734+ SYNOBS in 26 Subgroups produced

THE TRAINING PROCESS

A major thrust of ESCOE's efforts, and, in fact, the one upon which all ESCOE's activities have depended, has been that directed towards training facilitators in the LEAs in the writing and editing of behaviorally-stated objectives. Facilitators, once practiced and knowledgable, then trained teachers in their LEAs to write and edit objectives for their own courses. In this way, eighty facilitators and between 1000 and 1500 teachers were trained in the ESCOE theory and technique of writing objectives. In addition, approximately thirty-five facilitators during the two years of the project were trained in and carried out synthesis of raw objectives.

Facilitators were trained primarily at conferences held for that purpose once a year and subsequently at refresher workshops in the LEAs. Field services to the LEAs by ESCOE's two Coordinators for Secondary and for Post-Secondary schools have been a most important means by which both training and mutual feedback between ESCOE and the LEAs has been accomplished. Such services included introductory workshops on ESCOE and behavioral objectives, longer workshop sessions with practice in goal analysis and the writing of objectives, delivery of supplies and training materials to the facilitators, and assistance to the facilitators in editing objectives and in conducting workshops in their own LEAs for involved faculty.

The two field staff persons held at least two workshops a week in the various LEAs, and often more. These workshops were held at the

request of the LEA. The length of the sessions varied from two hours one day after school to a full two days, depending on the time made available by the LEA. Larger "regional" workshops were held approximately once a month. When synthesizing was begun, workshops on synthesis were held also.

Because the success of the ESCOE training process was so vital to the accomplishment of all of ESCOE's goals, much effort went into the development of training materials and approaches. The Behavioral Objectives Training Package, intended as a complete manual for all ESCOE facilitators, and later, for the use of teachers in the LEAs, was one such result. Some of the exercises from the Training Package are reproduced in the following pages. Staff members also developed three series of overhead transparencies with accompanying narration for use in their workshops. These series covered the topics of "An Introduction to ESCOE and Behavioral Objectives," "An Overview of Systems, Goal Analysis, and Objectives," and "Synthesis." Selected materials from these transparencies are also reproduced in this section as samples of the training content.

Filmstrips from The Instructional Objectives Exchange in California were bought and used, and another filmstrip on objectives is in process for ESCOE by a student at the University of Massachusetts. A programmed text on writing objectives was written and was printed in June 1972. Copies of this text will be available as a separate appendix.

Training, in whatever mode--workshops, publications, visual presentations--emphasized the background and philosophy of ESCOE--its purpose as a center, its reason for being, its relationship to the LEAs--as well as overviews of a systems approach to education, including thorough instruction (generation, rationale, uses, formats) in writing behavioral objectives, and thorough introductions to synthesis and to testing and evaluation.

The ESCOE staff came to see behavioral objectives as components of a total systems approach to education; this approach, as well as the writing of objectives, received emphasis in the training protocols. In fact, two courses, given through the University of Massachusetts Division of Continuing Education, were developed for those facilitators who wished to receive credit for their work as ESCOE facilitators and to further explore the possibilities of such involvement. These courses emphasized the integration of objectives writing with the systems approach to education and are described in this section of the Report.

In their work with facilitators and teachers the ESCOE staff adhered to the belief that each LEA existed with its own unique autonomy and significance. Facilitators and teachers committed to the ESCOE project did not simply produce objectives for ESCOE but were offered an intense exposure to the possibilities in curriculum development that may be gained through systems analysis and the imaginative use of behavioral objectives.

TRAINING OF FACILITATORS AND TEACHERS

AN OVERVIEW IN OUTLINE FORM

PURPOSES OF THE TRAINING

Facilitators

To prepare facilitators to:

1. teach faculty in their LEAs to write and edit objectives
2. organize and coordinate the process of preparing objectives in each LEA and to support the efforts of those writing them by informing administrators and teachers of the uses and advantages of objectives and of the LEA's association with ESCOE
3. edit objectives before sending them to ESCOE.

Teachers

To prepare teachers to fully describe their courses in terms of behavioral objectives in a format and of a quality acceptable to ESCOE.

TRAINING STRATEGIES

Facilitators

Accomplished primarily at the all-facilitator conferences held periodically at a central location.

Teachers

Accomplished primarily at workshops in individual LEAs, given by facilitators and/or ESCOE staff.

Lectures and panel presentations by ESCOE staff & guest speakers
Filmstrips
Overhead transparencies series, with narration
Small group exercises in writing, editing, and synthesizing objectives, using the Behavioral Objectives Training Package
Group discussions among participants and ESCOE staff members

GENERAL CONTENT COVERED DURING TRAINING PROCESS

Systems Approach to Education; Goal Analysis and Task Analysis
ESCOE: philosophy, inception, purposes, operations
Behavioral Objectives: definition, rationale and uses, how to write
Synthesized Objectives: as for behavioral objectives
Testing and Evaluation: relation to objectives, methods, purposes

OBJECTIVES OF TRAINING

Separate objectives were established for each workshop and conference. The following list was used at a curriculum development workshop and may be considered typical of more recent training sessions.

After completion of the workshop each active participant will be able to do the following:

Given a diagram of an educational system, describe the function of each component.

Given a goal and using the strategy of operationalizing fuzzy concepts, derive performance statements describing this goal.

Given a job, analyze and identify the necessary tasks required to successfully complete them.

State the three components of a behavioral objective, and describe the function of each component.

Recognize a behavioral objective by identifying its three component parts.

Given a performance statement, construct a behavioral (measurable) objective that contains all of the necessary components.

GUIDE TO REMAINDER OF PART III: THE TRAINING PROCESS

The remainder of this section consists of extracts from several of the modes of presentation used by ESCOE in its training programs. They appear in the following order:

"INTRODUCTION TO ESCOE AND BEHAVIORAL OBJECTIVES" - Narration for Overhead Transparencies

THE SYSTEMS APPROACH TO EDUCATION - List of Components

"HOW BEHAVIORAL OBJECTIVES ARE EVOLVED BY CURRICULUM DEVELOPERS OR TEACHERS" - Extract from an Introductory Presentation Shown on Overhead Transparencies

"OBJECTIVES: DEFINITIONS AND EXERCISES" - Exercises from the Behavioral Objectives Training Package

"TYPICAL AGENDAS FOR TWO TYPES OF ESCOE WORKSHOPS"

ESCOE CONFERENCES - Overview and Agendas

"COURSE CREDIT FOR ESCOE FACILITATORS" - Course Descriptions

"INTRODUCTION TO ESCOE AND BEHAVIORAL OBJECTIVES"

Narration for Overhead Transparencies

This narration (or sometimes an explanation of what is on a slide) is one example of the training protocol, illustrating the type of information presented in an introductory session, its order of presentation, etc.

Slide / Narration or Explanation of Slide
#

1. ESCOE - Acronym for Slide 2
2. Evaluation Service Center for Occupational Education - What is it?
3. A Catalyst - While nothing really new is involved in this portion of ESCOE's approach, it is possible that it could be the vehicle that could bring together and make operational the many facets of educational systems---objectives, teaching methods, teaching materials, media and evaluation techniques.
4. A Training Center - ESCOE, with a strong emphasis on service, is geared to provide a great deal of training for the faculties of LEAs.
5. A Data Collection Agency - All materials received by ESCOE will be coded, classified and entered in a computer data bank for retrieval under many different needs.
6. A Designer of Evaluation Instruments - After sufficient data have been collected in a given area of study, ESCOE, with the help of LEAs, will design and construct evaluation instruments.
7. A Unifying Agent - A great need exists for unification of the many levels of education. A center such as ESCOE that could ultimately serve all these levels may possibly be the agent that could bring this about.
8. Its Inception - ESCOE was brought into being because of a law.
9. The Law - stated on Slide 10.
10. Statement of Law - This law generated much thought as to how evaluation could be accomplished. Standardized testing was quite naturally one answer but was readily rejected.
11. A Need - This rejection of standardized testing brought about the need for an alternate method of evaluation. Thus the concept of ESCOE was born. The question was asked, "Why not let each LEA specify its own objectives and be tested on these in lieu of a standardized curriculum?
12. Its Philosophy explained in Slide 13
13. That it is much better for an LEA to specify its own objectives and then be tested upon these.
14. ESCOE's Role and Responsibility is spelled out in Slide 15.
15. ESCOE, with the help of the LEAs,will endeavor to fulfill its responsibility through a four-pronged attack. To operationalize the entire concept all four facets will be active concurrently

NARRATION FOR OVERHEAD TRANSPARENCIES (continued)

16. Facet I - Develop a Bank of Behavioral Objectives
The LEAs will appoint facilitators from their faculties to act as liaison with ESCOE. These facilitators will be trained by ESCOE to function as resource personnel and to assist the faculty in writing behavioral objectives.

17. Facet II - Create a Feedback Loop
LEAs will feed to ESCOE objectives, methods, lists of teaching materials, consultants, while ESCOE will feed to LEAs training personnel, training materials, testing instruments, etc.

18. Facet III - Develop Test Instruments
With the help of consultants from LEAs and testing specialists, ESCOE will develop testing instruments for use in the LEAs.

19. Facet IV - Create an Ongoing Service Center
ESCOE will continue to assist LEAs through supplying training personnel, training materials, printouts of objectives, lists of teaching methods and materials, etc.

20. Why Behavioral or Performance Objectives? is dramatically answered by Slide 21.

21. A quotation from Robert Mager: "If we don't know where we are going, how will we know when we have arrived?"

22. Behaviorally Stated Objectives ... Clarify Goals...

23. What is a Behavioral Objective? This question is answered in Slide 24.

24. A Definition of Behavioral Objectives and Slide 25.

25. The Parts of a Behavioral Objective. Conditions, Performance, Extent, and the function of each part.

26. How objectives and the systems-based approach differs from traditional approaches is answered, partially, in Slide 27.

27. An Educational System. Further expalined in Slide 28.

28. Showing the overall structure of an instructional system whereby the objectives are formulated. Directly after this formulation a criterion test is constructed, followed by the analysis of learning tasks, then by the design of the system itself. Evaluation is then made and finally the results of the evaluation are used to determine what changes, if any, are needed. This entire system makes possible a constant feedback of information dealing with success and/or failure of the total package, with some indication of where alterations, additions, or deletions are required.

29. Slide 29 states that another point of variance from normal teaching situations is that this system is learner-oriented. That is to say, objectives are written from the learner's, and not the teacher's, point of view. Clearly stated objectives help eliminate what is shown in Slide 30.

30. And perhaps your students are not seeing your objectives as you are.

31. Slide 31 states that we use precision action words, not broad statements, in defining our goals. Precise words tend to clarify our goals, and, if they are action words, results can be measured.

32. Slide 32 points out the fact that course goals and results are quite often two different things.

33. This Slide shows many words certainly useful in goal statements which should not be used in behaviorally or performance stated objectives. There are as many different interpretations of these words as there are people involved.

34. Here are words that are more clear, more easily measured, and that are preferred over more general terms.

35. This Slide points up the fact that all testing in this program is criterion-referenced evaluation and not norm-referenced evaluation in which we measure one student against another.

36. Mastery teaching is emphasized over marking on a curve, normal practice in norm-referenced evaluation.

37. Evaluation should pinpoint what we are doing right and what we are doing wrong.

38. "Who gains from all this activity?"

39. The student gains;

40. The teacher is also a gainer;

41. The administrator is a gainer;

42. As well as the employer

43. And the public.

44. Slide 44 points up the way ESCOE intends to bring all of this about--through service to the LEAs.

[Slides 45-53 point out various actions ESCOE is taking in its attempt to fulfill its stated goals.]

45. Training facilitators from LEAs to write and edit behaviorally stated objectives.

46. Conducting workshops in the LEAs to assist facilitators in training their faculties.

47. Assisting in the development of objectives in selected areas of study through local facilitators.

48. Codifying and placing these objectives in a computer data bank.

49. Employing consultants in various subject areas to synthesize objectives.

50. Developing the feedback loop by various devices such as simplified forms and check-off systems.

51. Bringing to the Center subject area specialists to work with testing specialists in developing testing instruments.

NARRATION FOR OVERHEAD TRANSPARENCIES (continued)

52. Training facilitators in test administration.

53. Assisting in test administration at the LEAs.

54. Slide 54 sums up with a statement that performance objectives "Say it like it is!" In other words, they clearly state what the student is to learn in a course or module of instruction.

55. The Advantages. These stated advantages are but a small part of various advantages among many suggestions that have been given to the Center by its various participating LEAs.

56. We can evaluate programs without standardizing them.

57. It is really an excellent curriculum development tool.

58. The entire program is always flexible, always open for modification.

59. Slides 59 and 60 show a list of many other advantages possible through the implementation of the entire system.[1]

[1]For specification of this and other statements in the narration, write to Mr. Walter Long, ESCOE, Hudson Valley Community College, Troy, New York.

THE SYSTEMS APPROACH TO EDUCATION[1]

The ESCOE staff came to see behavioral objectives as components of a total systems approach to education. This list represents the model taught to ESCOE facilitators.

1. STATE GOALS

2. DEFINE OBJECTIVES

3. CONSTRUCT CRITERION-REFERENCED TEST

4. IDENTIFY INDIVIDUAL LEARNING OBJECTIVES

5. SELECT APPRORPIATE LEARNING STRATEGIES

6. SELECT APPROPRIATE MATERIALS

7. DEFINE AND ASSIGN APPROPRIATE PERSONNEL ROLES

8. IMPLEMENT THE PROGRAM

9. TEST AND EVALUATE STUDENT OUTCOME

10. REFINE AND REVISE AS NECESSARY

[1]From The Conditions of Learning by Robert Gagne

"HOW BEHAVIORAL OBJECTIVES ARE EVOLVED
BY CURRICULUM DEVELOPERS OR TEACHERS"

Extract from an Introductory Presentation
Shown on Overhead Transparencies

I. Approaches to Goal Analysis

A. Goals. What are they? Where do they come from?

Goals start out as statements like these: You should... It would be nice if... A citizen is... Education's responsibility is...

B. These broad educational goals come from: Students, Industry, Teachers, Home, Community, Nation....

The curriculum developer gets his goals from these sources and from using some approaches to goal analysis, such as:

- Operationalization of Fuzzy Concepts[1]
- Task Analysis
- Critical Incidents Analysis

- Operationalization of Fuzzy Concepts (Hutchinsonian method of goal analysis)

  Strategy for turning vague goal statements into measurable rerformance statements

- Task Analysis

  Analysis of the goal to determine what the competent person does, or what performances are required, to demonstrate that the goal has been accomplished

- Critical Incidents Analysis

  Determination of what was done (performance) when the job was accomplished successfully.

C. From the curriculum developer's expressional goals, performance statements in the form of measurable objectives are written.

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[1]Tom Hutchinson, The University of Massachusetts, School of Education, "The Operationalization of Fuzzy Concepts," 1971.

"HOW OBJECTIVES ARE EVOLVED" (continued)

II. Some Categories of Objectives

MEASURABLE BEHAVIORAL OBJECTIVES	FALL INTO TWO CATEGORIES	
	Primary Intent Objective	An objective that measures the directly observable physical act that <u>is</u> the desired outcome of a program of instruction.
	Indicator Objective	A measure from which capabilities (cognitive and affective) may be <u>inferred</u>.

Primary Intent Objective

[The teacher thinks: "If I can observe the student coming down a slope on skiis and he makes it all the way to the bottom, then I will know that he can ski."]

This objective operationalized becomes the following primary intent objective:

"Given skiis, poles, skiing clothes, and a snowy slope, the student will ski down the mountain without falling."

Indicator Objective

[The teacher thinks: "I would like to know if the student knows and can apply the law of levers."]

This objective operationalized becomes the following indicator objective from which a capability may be inferred:

"Given a bar 6 feet in length, a small iron block to use as a fulcrum, and a 100-pound weight, the student will place the fulcrum under the bar at the proper position for a 50-pound force at the end of the lever to raise the weight."

OBJECTIVES: DEFINITIONS AND EXERCISES

THE THREE COMPONENTS OF A BEHAVIORAL OBJECTIVE[1]

Component 1

PERFORMANCE - Write a statement describing one of your educational intents and then modify it until it answers the question: "What is the learner doing when he is demonstrating that he has achieved the objective?"

Component 2

CONDITIONS - Define the desired behavior further by describing the important condition(s) needed to achieve the stated objective.

Component 3

EXTENT - Add to this how well the student is expected to perform.

EXERCISES

On the following pages will be found examples of the exercises designed by the ESCOE staff and published in the Behavioral Objectives Training Package. This Training Package (for Facilitators and Teachers) became one of the major instructional instruments used by ESCOE and, later, by the facilitators in their workshops.

[1]Operational definitions from an overhead transparency series produced by ESCOE.

OBJECTIVES: DEFINITIONS AND EXERCISES (continued)

EXERCISE 1: What Do You Think Behavioral Objectives Are?
(You may check more than one answer.)

_____ A. Statements that give the instructor a general outline of the course structure.

_____ B. Statements that tell the instructor exactly what the students are to learn, how well they are to learn, and any necessary conditions under which the learning is to take place.

_____ C. A series of understandings for the students to learn in class.

_____ D. The behaviors the student should acquire during the course of instruction.

Answers: B, D

EXERCISE 2: What Forms A Behavioral Objective

Identify the three components of a behavioral objective by writing in the space provided next to each statement whether it is a Condition, Performance, or Extent.

1. Engineering Related Technology

_____ A. The student will trace the light path from its source by naming the parts through which it must pass.

_____ B. At least 4 out of 5 parts correct

_____ C. Given a line diagram of an optical metallurgical microscope

2. Auto Mechanics

_____ A. 95% accuracy, time 15 minutes

_____ B. List in writing the properties in a coolant

_____ C. From memory without reference material

3. Agricultural Technology

_____ A. The student will draw the cooling curve for the given alloy

EXERCISE 2 (continued)

_____ B. A complex schematic or actual equilibrium diagram and a specific alloy composition

_____ C. 80% correct

Answers: 1. A. Performance
B. Extent
C. Conditions

2. A. Extent
B. Performance
C. Conditions

3. A. Performance
B. Conditions
C. Extent

4. Write a brief description of each component: Conditions, Performance, Extent.

5. List a few brief examples of each component.

EXERCISE 3: Are You Writing Good Behavioral Objectives?

Pause to see if you can check the correct answers.

1. Which of the following words would be used in a good behavioral objective?

_____A. Grasp _____C. List _____E. Compute _____G. Understand

_____B. Believe _____D. Measure _____F. Identify _____H. Know

Answers: C, D, E, F

2. Which of the following is NOT a behavioral objective component?

_____ A. Statement of desired behavior (what the student is expected to do to demonstrate achievement of the objective).

_____ B. Delineation of the teacher's role in the learning process.

_____ C. Specification of conditions under which behavior should be demonstrated.

_____ D. Statement of the criteria for success.

Answers: B

EXERCISES (continued)

Exercise 4: A Good Behavioral Objective:

_____A. Is stated in directly observable performance terms

_____B. Allows for considerable ambiguity (can be interpreted differently by different people).

_____C. Can be used as a yardstick to assess a student's degree of achievement: how well he has accomplished what he was expected to do

_____D. Is stated with sufficient specificity and clarity to be useful

_____E. Is a highly complex development

_____F. Talks about general goals of learning

Answers: A, C, D

EXERCISE 5: How could the following statement be converted into behavioral terms: "Appreciates the value of the scientific method."

_____A. Knows the scientific method and applies it effectively

_____B. Understands the principles of the scientific method

_____C. Uses correct experimental procedures in problem solving

_____D. Is able to list the basic principles of scientific procedures

Answer: D

TYPICAL AGENDAS FOR TWO TYPES OF ESCOE WORKSHOPS

Curriculum Development Training Workshop[1]

DAY 1

Introduction to ESCOE

The Systems Approach

Goal Analysis ("The Operationalization of Fuzzy Concepts")

Other Approaches to Goal Analysis

Considerations and Rationale for the Writing of Objectives

DAY 2

The Three Components of a Behavioral Objective

Objective Writing Exercise (small groups)

DAY 3

Objective Writing (entire group)

Blocks and Units

Behavioral Objective Reporting Form (#12B)
1. Coding Header 2. Category Breakdown
3. The Three Domains

[1]Agenda for a workshop held as part of a longer conference on curriculum development at Agricultural and Technical College at Delhi, Delhi, New York, June 12-16, 1972.

Synthesis Workshop[2]

I. Introduction to Behavioral Objectives
   A. Characteristics (Conditions/Performance/Extent)
   B. What Does a Behavioral Objective Do?
      1. describes an observable act
      2. infers capabilities
   C. Writing Exercises (small groups)

II. Block and Unit Breakdown
   A. What is it?
   B. What is it used for?

III. Introduction to Synthesized Objectives
   A. Definition
   B. Preparation for synthesis
   C. Mechanics

IV. Synthesis Writing Exercises (small groups)

[2]Agenda for a workshop held at Northeast Metropolitan Regional Vocational High School, Wakefield, Massachusetts, February 23-24, 1972.

ESCOE CONFERENCES

Eight major conferences for the purposes of planning, training, and dissemination for ESCOE administrators and facilitators have been conducted by The Evaluation Service Center since its inception. These conferences are described on the following pages.

Administrators' Conferences: Rationale

It has been a point of major concern that administrators (principals, directors, superintendents, etc.) of LEAs, although they might not be directly involved in the writing of objectives, be fully supportive of the members of their staffs -- facilitators and teachers -- who were directly involved. Conferences focusing on planning and reporting of ESCOE activities and services were emphasized for the administrators.

Facilitators' Conferences: Rationale

The facilitators' role in the project has been:

1. organization and coordination of the process of preparing behavioral objectives in each LEA;
2. liaison between the school administration and faculty to expedite preparation of objectives, including appropriate allocation of staff time;
3. editing of all objectives in preparation for transmittal through the Center's field representatives to ESCOE;
4. impressing both administrators and teachers with the value to be received from use of the data bank and related services from ESCOE.

Conferences for facilitators have been directed towards preparing this group for their responsibilities in the LEAs and to ESCOE.

CONFERENCES (continued)

CONFERENCE I

Initial Administrators' Planning Conference
September 1970
Albany, New York

Approximately 25 administrators from 10 LEAs in Massachusetts and 10 in New York met with project developers for planning and to make a commitment to the project.

CONFERENCE II

First Facilitators' Training Conference
November 1970
Amherst, Massachusetts

Thirty-five facilitators from committed LEAs (10 in each state) attended this conference to acquire skills in writing behavioral objectives. At this conference the format for submission of objectives to ESCOE was developed.

CONFERENCE III

Second Facilitators' Training Conference
January 1971
Amherst, Massachusetts

Thirty-five facilitators, from 10 LEAs in each state, attended this follow-up conference to consolidate skills previously acquired and to plan for the coming year.

CONFERENCE IV

Dissemination and Planning Conference for All Facilitators
May 1971
Bass River, Cape Cod, Massachusetts

Thirty-six facilitators from 10 LEAs in Massachusetts and 8 in New York attended this conference for the dissemination of raw objectives in the form of printouts from the data bank. Instruction was given in how to read and use the printouts and in the use of

the data bank for program analysis and development. Information on the selection of objectives and on the extension of the data base to more program areas was given, as well as on test development. Plans for the 1971-72 school year were discussed.

CONFERENCE V

Administrators' Planning Conference
September 1971
New York City

Thirty-five administrators from 13 Massachusetts LEAs and 9 New York LEAs attended the conference. Six administrators from 5 Pennsylvania schools also attended. The purpose of this conference was to develop a detailed agreement between the LEAs and The Evaluation Service Center. This agreement was specific for both parties and described the services the schools could expect from ESCOE during the year and the expectations that ESCOE had of the LEAs. (This Service Commitment is reproduced elsewhere in the Final Report.) The conference also presented a comprehensive description of ESCOE services and a demonstration of the work already developed.

CONFERENCE VI

Second-Year Facilitators' Conference
October 1971
Chicopee, Massachusetts

Fifteen facilitators from 7 Massachusetts LEAs and 5 New York LEAs attended the conference. The purpose of this conference was to review ESCOE and LEA activities of the past school year, to teach participants about the process of synthesis and the uses of synthesized objectives that were developed over the summer, and to resolve plans for the present school year. The major portion of instructional time was spent on synthesis; addresses on the systems approach to program improvement and on computer usage were also given.

[continued on next page]

CONFERENCE VII

Training Conference for New Facilitators
November 1971
Chicopee, Massachusetts

Thirty-five facilitators from 7 LEAs in Massachusetts and 11 LEAs in New York attended. This four-day conference concentrated on training facilitators new to the project in the content and techniques necessary to their fulfilling their commitment to their LEAs and to ESCOE. The agenda reproduced below will give a good idea of what such training includes.

AGENDA
"A Systems Approach to Program Improvement"
"Introduction to Behavioral Objectives"
Writing Behavioral Objectives - Small Group Exercises
Exercise in Editing Objectives - Small Groups
"A Glimpse at Domains" [Psychomotor, Cognitive, and Affective Classifications of Tasks]
Behavioral Objective Reporting Forms - Explanation and Exercises
Test Development: Principles and Status
"Synthesis of Objectives: A Brief Overview"
"The SYNOB Package: An Introduction"
Development and Selection of Objectives - Explanation and Exercises
Implementation and Usage of Objectives - " " "
Plans for the Future: Discussion

CONFERENCE VIII

Spring Dissemination and End-of-Project Conference
for All Facilitators
May 1972
Monticello, New York

Thirty facilitators from 8 Massachusetts LEAs and 12 New York LEAs attended this final ESCOE conference. Questionnaires for the project evaluation were administered and a comprehensive review of the project's activities undertaken. The future of the project's developmental work in Massachusetts and New York was presented. An overview of the principles and activities of the Comprehensive Achievement Monitoring (CAM) services was given by Dr. William Gorth and a representative from the New York State Department of Education spoke on the Special Education Instructional Materials Center (SEIMAC).

COURSE CREDIT FOR ESCOE FACILITATORS
through The University of Massachusetts
Division of Continuing Education

"The University of Massachusetts is offering credit, through the Division of Continuing Education, for each year of active participation as a facilitator in the ESCOE project."

from a memo to all facilitators
November 1971

"The purpose of the course(s) is to allow teachers in occupational education to earn University credits by direct involvement with a research project. The ESCOE project is philosophically rooted in teacher-generated input."

from a memo to all facilitators
April 18, 1972

14 Facilitators enrolled in Education 386/686, 'Systems Management for Occupational Education,' 1971. 5 credits.

41 Facilitators enrolled in Education 383/686, 'Systematic Approach to Curriculum Development in Occupational Education.' 1972. 5 credits.

Fees were the usual $10 and $15 per credit for Massachusetts and out-of-state residents respectively.

COURSE DESCRIPTIONS

1971/Education 386/686: 'Special Problems in Education: Systems Management for Occupational Education.' Instructor: Alfred R. Rios, Assistant Director, Evaluation Service Center. 5 credits.

Students will attend two workshops each semester, to be conducted by the ESCOE staff, and will participate in one meeting per week within their own LEAs. A two-hour per week work schedule under the direction of the ESCOE staff will include:

1. A study of developing a systems approach to student learning environments;
2. implementation of a model for developing behavioral objectives;
3. training of teachers in the writing of behavioral objectives;
4. writing objectives for student's own course of study (Education 386/686).

[14 facilitators completed this course.]

COURSE CREDIT FOR ESCOE FACILITATORS (continued)

1971/Education 386/686: 'Special Problems in Education: Systematic Approach to Curriculum Development in Occupational Education.' Instructor: Kenneth Ertel, Director, Center for Occupational Education. 5 credits.

Facilitators will attend the three ESCOE conferences planned for this year. They will conduct workshops in their own schools under the direction of the ESCOE field staff. They will train teachers to write behavioral objectives according to the ESCOE format. Facilitators are responsible for the orientation of teachers in their schools as to use and implementation of objectives.

Facilitators' training will be aimed at their learning to:

1. develop a systems approach for learning environment;
2. write and use behavioral objectives for local programs;
3. train teachers and conduct workshops in behavioral objectives;
4. synthesize objectives for an occupational program;
5. use criterion-referenced tests to evaluate student achievement;
6. modify curriculum based on system feedback.

Suggested readings:

1. Developing Vocational Instruction. Robert Mager.
2. Writing Performance Goals: Strategy and Prototypes. McGraw-Hill.
3. Instructional Systems Development for Vocational and Technical Training. F. Coit Butler. Educational Technology Publications.

[41 facilitators completed this course.]

IV

SYNTHESIZED OBJECTIVES
CONCEPT, PRODUCT, AND PROCESS

SYNTHESIZED OBJECTIVES
THE CONCEPT AND PRODUCT OF SYNTHESIS

THE CONCEPT

ESCOE has expanded a model for synthesizing behavioral objectives that was developed by David Berliner in 1969.* The synthesized objective provides a sophisticated form that is more efficient than individual objectives and allows for a variety of local instructional needs and preferences. Test construction also required a consolidation of objectives according to similarity of performance. Identical or similar performances from different LEAs were written as one objective with a variety of "form changes." Substitution of a form change for a portion of the fixed text yields equivalent forms of the same task. In a well-written SYNOB the "performance" is fixed and without form changes; form changes will be found only in the "conditions" and "extent" portion of the SYNOB.

AUGUST 1971

2571 RAWOBs in 4 subgroups synthesized into 343 SYNOBs.

JUNE 15, 1972

1354 RAWOBs in 12 subgroups synthesized into 381 SYNOBs.

1667 RAWOBs in 10 subgroups "in process" of synthesis.

THE PRODUCT

Synthesis of objectives in four subgroups (Automotive Mechanics, Cabinetmaking & Millwork, Industrial Electronics, and Machine Shop) was begun in July of 1971 and completed in August 1971. A total of 2571 raw objectives in these subgroups were synthesized into 343

*See pages 60-63

SYNOBs. In October of 1971 these SYNOBS were entered into the data bank.

LEAs received computer printouts of SYNOBS in the above four subgroups and were asked to indicate which portions of their programs were covered by the SYNOBs and form changes for those subgroups. This request was made by ESCOE in order that test development personnel would be able to recognize the extent and limitations of the information with which they were working.

In March of 1972 nineteen facilitators and teachers began synthesizing objectives in ten occupational areas comprised of twenty-two subgroups. As of June 15, 1972, synthesis for twelve subgroups was completed, with a total of 381 SYNOBs derived from 1354 RAWOBs. Synthesis for the remaining ten subgroups will be completed in July 1972. At that time all SYNOBs will be entered into the data banks of both states. The ten occupational areas for which objectives have been synthesized during school year 1971-72 are the following: Auto Body, Baker, Chef/Cook, Commercial Art Occupations, Drafting Occupations, Electrical Occupations, Graphic Arts Occupations, Metal Fabrication, Practical Nursing, and Woodworking--all at the secondary level.

Examples of four synthesized objectives, exactly as they appear on the computer printouts, are given on the two following pages.

ESCOE SYNTHESIZED OBJECTIVES

SYNOB I.D. S171502/053 YEAR 08/71
INDUSTRIAL ELECTRONICS

BLOCK 02 PASSIVE CIRCUITS - AC
UNIT 09 SERIES AC ANALYSIS

1.0 CONDITIONS

GIVEN AC SUPPLY VOLTAGE
( ) 1.11 3 CAPACITORS
( ) 1.12 NO. OF RESISTORS MAY VARY
AND A
( ) 1.21 VTVM
( ) 1.22 VOM
( ) 1.23 DIGITAL VOLTMETER

2.0 PERFORMANCE

MEASURE AND CALCULATE THE VOLTAGE DROPS ACROSS EACH CAPACITOR, WHEN THEY ARE CONNECTED IN SERIES ACROSS THE SUPPLY VOLTAGE

3.0 EXTENT

( ) 3.11 ACCURACY OF MEASUREMENTS 98%
( ) 3.12 WITHIN THE TOLERANCES OF THE EQUIPMENT
( ) 3.21 ACCURACY OF CALCULATIONS WITHIN 2%
( ) 3.22 SLIDE RULE ACCURACY
( ) 3.23 INSTRUCTORS' DISCRETION

SYNOB I.D. S170302/029 YEAR 08/71
AUTOMOTIVE MECHANICS

BLOCK 04 CHASSIS & BODY
UNIT 01 FRONT SUSPENSION

1.0 CONDITIONS

GIVEN
( ) 1.11 VEHICLE
( ) 1.12 LAB UNIT
WHEEL BEARINGS, GREASE, TOOLS
( ) 1.21 JACK
( ) 1.22 LIFT
STANDS, CLEANER, MANUAL

2.0 PERFORMANCE

REMOVE, CLEAN, INSPECT, REPACK,
( ) 2.11 INSTALL
( ) 2.12 NEW
AND ADJUST PRELOAD OF FRONT WHEEL
( ) 2.21 ROLLER BEARINGS
( ) 2.22 TAPER BEARING

3.0 EXTENT

TO MANUFACTURER'S SPECIFICATIONS, AND COTTER PINS INSTALLED PROPERLY

ESCOE SYNTHESIZED OBJECTIVES

SYNOB I.D. S172302/038 YEAR 08/71
MACHINE SHOP

BLOCK 02 MILLING MACHINE
UNIT 09 MILLING, FORM

1.0 CONDITIONS

GIVEN MILLING MACHINE, B.P. TOOLS
( ) 1.11 CONCAVE MILLING CUTTER
( ) 1.12 ANGULAR MILLING CUTTER
( ) 1.13 CONVEX MILLING CUTTER

2.0 PERFORMANCE

MILL FORM

3.0 EXTENT

+ - 1/64" ON LOCATION

SYNOB I.D. S173601/013 YEAR 08/71
CABINETMAKING & MILLWORK

BLOCK 02 HAND TOOLS
UNIT 01 MEASURING TOOLS

1.0 CONDITIONS

GIVEN
( ) 1.11 BENCH RULE
( ) 1.12 STEEL TAPE
( ) 1.13 ZIG ZAG RULE
PENCIL,
( ) 1.21 COMBINATION SQUARE
( ) 1.22 TRY SQUARE
( ) 1.23 STEEL SQUARE
STOCK AND SPECS

2.0 PERFORMANCE

MEASURE AND MARK THE STOCK TO SPECIFICATIONS

3.0 EXTENT

( ) 3.11 MEASURE TO + - 1/64"
( ) 3.12 TEACHERS' DISCRETION

SYNTHESIZED OBJECTIVES
THE PROCESS OF SYNTHESIS

"Synthesis": ESCOE Definition

The process of combining individual, independently generated raw objectives for the same performance into a single, "synthesized" objective--or "SYNOB."

The first step in the process of synthesis is to retrieve objectives from the data bank, one objective per page, by Block and Unit classifications within Subgroups. The raw objectives are then manually sorted according to similarity of performance.

THAT IS TO SAY:
1. collect RAWOBs in subgroups
2. code RAWOBs by Block and Unit
3. group RAWOBs within the Units by similarity of performance
4. look for similarities of performance that may exist across Units and group RAWOBs further.

The groups of raw objectives are now ready for synthesis.

MECHANICS OF SYNTHESIS

For objectives with similar PERFORMANCES, make three lists, one for each component of the objectives: Performance, Conditions, Extent. From these lists, first remove the redundancies, then identify the fixed (most typical) text, and the variable (atypical) text, which become the "form changes." Then write the synthesized objective. The process of synthesis can be seen in schematic form on the following pages.

SYNTHESIZERS IN THE LEAs

Synthesis for each subgroup was accomplished by two teachers and/or facilitators working in the instructional areas of their expertise. Special training workshops in the process of synthesis were held in the LEAs, in addition to the emphasis on synthesis at the Conference for Second-year Facilitators in October 1971. ESCOE staff was available for consultation at LEAs and continued to conduct smaller workshops in synthesis throughout the year.

SYNTHESIZED OBJECTIVES: THE PROCESS -- Schematic

Conditions, Performances, Extents for several objectives combine into one objective with form changes as options.

SORT RAWOBs
[by Blocks & Units]

PERFORMANCE_____
_____
CONDITIONS_____
_____
EXTENT_____
_____

PERFORMANCE_____
_____
CONDITIONS_____
_____
EXTENT_____
_____

PERFORMANCE_____
_____
CONDITIONS_____
_____
EXTENT_____
_____

COMPILE 3 LISTS

PERFORMANCES
_____
_____
_____

CONDITIONS
_____
_____
_____

EXTENTS
_____
_____
_____

WRITE SYNOB
[eliminate redundancies; identify fixed & variable text]

PERFORMANCE_____
_____
_____

CONDITIONS_____
_____
1.11
1.12

EXTENT_____
_____
3.11
3.12

OVERVIEW OF THE PERFORMANCE CRITERIA IN MACHINE SHOP EDUCATION[1]

The decision was made to try and systematize the performance criteria in one area of vocational education. The area chosen was machine shop because it is a standard subject area in most vocational educational programs. Moreover, all schools contributing input to the vocational education evaluation system wrote behavioral objectives in this area. Further, since a system for codifying behavioral objectives was needed, a single representative area had to be chosen for pilot examination.

The first task undertaken was the development of a coding system for retrieval of behavioral objectives by domain. A system was devised that with minimum modification could be used in a computer retrieval system. The code used is as follows:

2 digits - area or course designation
2 digits - division within course
3 digits - unit
2 digits - unique identification
2 digits - school code
1 digit - grade level

Thus a string of digits such as 01 01 002 01 05 2 would signify machine shop as the course (01), lathe work as the division (01), straight turning as the unit within lathe operation (002), and that this is the first objective under that subclassification, i.e., its unique identifier is (01). Further, the (05) signifies that this behavioral objective is taught at Haverhill, and the final (2) indicates its occurrence is at the 10th grade. A small part of the system developed for machine shop is illustrated below.

Course Division Unit Unique	Course	Division	Unit	Unique
Machine Shop	01	-	-	-
Lathe	01	01	-	-
Threading-Internal	01	01	001	01
-External	01	01	001	02
Straight Turning	01	01	002	01
Tapering	01	01	003	01
Boring	01	01	004	01
Reaming-straight	01	01	005	01
-tapered	01	01	005	02
Necking	01	01	006	01
Chamfers & Aryles	01	01	007	01
Set-up	01	01	008	01
Drill Press	01	02	-	-
etc.				

[1]David Berliner, University of Massachusetts, 1969. This is the original conceptual statement on which the process of synthesis at ESCOE was based.

The second major task undertaken was the unification of the behavioral objectives received from various sources. A single statement of a behavioral objective was written, incorporating the common elements intrinsic in the various statements of performance for a given machine shop task. Thus the five or six statements on lathe work with use of a holding device were analyzed and a single statement of objectives was written. To satisfy each of the local schools, whose autonomy was in no way to be impuned, we have developed a system of form changes for the behavioral objective which gives wide lattitude in usage for each school. (This is in addition to a retrieval system that allows each school to have, should it desire it, its original statement of performance.) Thus, with this approach we might have taken the following behavioral statements:

(A) When given a blueprint of a job containing an angle, the student will produce the part using a compound rest,adhering to indicated tolerances. Tolerance at this level should not be less than plus or minus 1/2".

(B) When given a blueprint of a job containing a chamfer, the student will produce the part using the compound rest, adhering to indicated tolerances. Tolerance at this level should not be less than plus or minus 1/64";

synthesized them and developed this single revised statement:

Given a (1) blueprint of a job containing an (2) angle the student will produce the part using a compound rest, adhering to (3) tolerance of ±1/64".

We could develop from the behavioral objectives the following form changes. (Those aspects of the single revised statement which can be modified were underlined and numbered above. Substitutions for these key words are then provided.)

(1) piece of stock; model to match
(2) chamfer
(3) ±1/2".

The three substitutions, all roughly equivalent forms of the same behavioral task, though perhaps requiring different levels of competency and experience to perform them, provide the teacher with 3x2x2 different behavioral statements, each of which taps the skill that is important to the teacher. In some cases this technique of specifying form changes yields an infinite number of roughly equivalent,

nominally parallel, forms of the performance test a student is to take. The level of difficulty of a task, perhaps best noted in the specification of tolerances, can be manipulated according to grade level since different schools give instruction in different skills at various points in the curriculum. Further, tasks can be done early in a program at one level of difficulty (e.g., tolerance required is ±1/32") and after other skills develop (i.e., ability to use a micrometer) a different level of tolerance may be set (e.g., tolerance set at ±.001).

Thus the form changes are seen to be an important new development in the specifying of behavioral objectives. The characteristic of the form change which allows for different levels of competency to be demonstrated in the accomplishment of a particular performance points toward that aspect of the system called screening tests. For different levels of performance different prerequisite skills are required. In the example cited above one level of competent performance could only be achieved with prerequisite knowledge of a ruler. To achieve the higher level of competency prerequisite skills must be mastered for using the micrometer. The screening tests then serve the instructor with a handy guide for determinging at least some of the knowledge and skills necessary for a student to have mastered before attempting a machine performance. Both knowledge and skills tests can be described in that section called screening tests.

Most of the objectives received were written with machine or hand skill performance in mind. The related science aspects have not, at this time, been effectively described. In the section provided for screening tests associated with each behavioral objective those aspects of a related science which are prerequisites can be specified. Thus at the simple level, computation of Ohm's Law is seen as a necessary prerequisite for circuit testing in electronics; knowledge of the function of twelve important parts of a lathe might be a screening test for certain lathe operations; load-stress and durability information about different materials may be important prerequisite knowledge about upholstering operations; recognition of each kind of cutting tool may be prerequisite to certain cutting machine operations, etc.

Many paper and pencil tests can be developed for inclusion in the category of screening tests. Simulated techniques, utilizing scale models of machines may be developed and used to screen students. The major point is that the use of screening tests completes the description of specifications about a task because they specify the level of the entering behaviors a student must have mastered before one wants to allow the student to try a skilled performance on a machine. Time is too precious, and the costs of equipment too great to merely allow anyone who wishes to attempt an objective free reign. The screening

tests, after appropriate psychometric study, should contribute much to the practical working of the vocational education system.

It should be noted that the collection of many behavioral objectives, form changes providing many "equivalent forms" for performance testing, and screening tests, constitutes an example of curriculum development which is of tremendous utility. The entire machine shop curricula for the state can be described, schools and districts can obtain comparative information, and can choose and pick those objectives that should be taught or than can be taught in their own geographic areas. Moreover, evaluation for each objective will provide an overall picture of vocational education within the state, with no sacrifice to local autonomy since the form changes allow for diversity of goals. The concept of readiness or entering behaviors in curricular formulation is treated in fact, and not just given lip service, through the use of the screening tests. It is believed that this model of curriculum development, which incorporates diversity, avoids all the old fantasies about centralized, mechanized, and systematized imposition of goals on local districts and, at the same time, provides a framework within which centralized, mechanized and systematic evaluation of goals can be undertaken.

V

THE FEEDBACK LOOP

INTRODUCTION TO V: THE FEEDBACK LOOP

The basic feedback process consists of the processes described below. LEAs send raw objectives to ESCOE on the Behavioral Objective Reporting Form (#12B). ESCOE returns to the LEAs computer printouts of the raw objectives and also a matrix showing the total number of raw objectives submitted to ESCOE by each LEA in each Subgroup, in each Block within the Subgroup, and in each Unit within the Blocks. When compared with the Block and Unit Breakdown for a particular Subgroup, the RAWOB Matrix informs each LEA where its own contribution of behavioral objectives fits into the ESCOE data bank. Then, when objectives for a Subgroup have been synthesized, printouts of the SYNOBS are sent to each LEA, along with a SYNOB Matrix which, as with the RAWOB Matrix, indexes the synthesized objectives within a Subgroup by Blocks and Units. With this information, the LEAs return to ESCOE information on the appropriateness of the SYNOBS in question for the occupational areas offered by an LEA. Such response is returned to ESCOE via the SYNOB Selection Reporting Form (Form A) and the Block and Unit Coverage by SYNOBs (Form B). Those forms bearing feedback from the LEAs to ESCOE are the subject of this section. Further details may be found in the Instruction Manual: Synthesized Objective Package.

OBJECTIVE REPORTING FORMS

BEHAVIORAL OBJECTIVE REPORTING FORM (#12B)

This form is the one on which raw objectives have been submitted by the LEAs to ESCOE. Besides the objective itself, the Behavioral Objective Reporting Form asked for information identifying that objective in many dimensions, which then could be used to retrieve the objective from the data bank. The particular layout of this form may well not be useful in a context other than that of ESCOE; however, an acquaintance with the kinds of information requested about an objective may prove useful to others undertaking a similar project. A full explanation of Form #12B follows the sample of this form.

OBJECTIVE EDITORIAL FORMS

Form D and the Objective Editorial Comments form were each used by ESCOE for response from the LEAs to objectives on the RAWOB printouts. A response on Form D might include "second thoughts" on the writing of an objective, its phrasing or emphasis, as well as factual corrections. These two forms are reproduced at the end of this section.

BEHAVIORAL OBJECTIVE REPORTING FORM (#12B)

Form #12B January 1972

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

ID Number | Yr | T | N | C | St. | City-School | Lvl | No. Tk.

Cap. Cl. | FI | GR | SG | BL | MT | UN | Related Subj. Discipline

Field of Study _____ State _____

Major Group _____ School _____

Subgroup _____ Instructor _____

Block _____ Facilitator _____

Major Topic _____ Level _____
(Post Secondary Only)

Unit _____ No. Taking Objective _____

School Year Written _____

Behavioral Objective

Condition(s) _____

Performance _____

Extent _____

Form #12B - Reverse

CAPABILITY CLASSIFICATION

Behavioral Objective Reporting Form

Psychomotor

[ ] Psychomotor (Check only if performance requires significant muscular activity)

Cognitive

(Check the one cognitive capability that best describes the mental activity involved)

Knowledge Acquisition

[ ] C1.1 Knowledge of Specifics

[ ] C1.2 Knowledge of Ways and Means of Dealing with Specifics

Knowledge Application

[ ] C2.1 Knowledge Application Without Alteration

[ ] C2.2 Knowledge Application With Alteration

Related Subject Discipline (Check those applicable)

MATHEMATICS

10 [ ] Basic arithmetic & operations
11 [ ] Informal algebra
12 [ ] Informal geometry
20 [ ] Applied arithmetic
21 [ ] Geometry & measurement
22 [ ] Algebra, graphs, problem solving
30 [ ] Algebra (first year)
31 [ ] Algebra (second year)
32 [ ] Algebra (third year)
33 [ ] Geometry
34 [ ] Trigonometry
35 [ ] Business Arithmetic
36 [ ] Consumer Mathematics
37 [ ] Shop Mathematics
38 [ ] Calculus
39 [ ] Computer Mathematics

OTHER (Specify)

80 [ ] _____
81 [ ] _____
82 [ ] _____
83 [ ] _____
84 [ ] _____

SCIENCE

40 [ ] General Science

Biology

50 [ ] General Biology
51 [ ] Anatomy
52 [ ] Bacteriology
53 [ ] Biochemistry
54 [ ] Ecology
55 [ ] Nutrition
56 [ ] Physiology

Chemistry

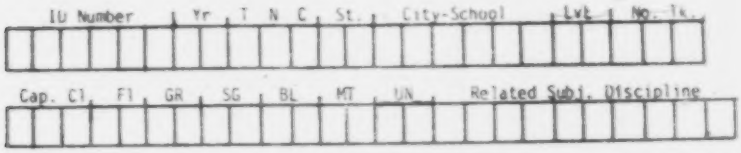
60 [ ] General Chemistry
61 [ ] Inorganic Chemistry
62 [ ] Qualitative Analysis
63 [ ] Quantitative Analysis
64 [ ] Materials Science

Physics

70 [ ] General Physics
71 [ ] Electricity & Magnetism
72 [ ] Electronics
73 [ ] Heat
74 [ ] Mechanics
75 [ ] Nuclear Science
76 [ ] Optics
77 [ ] Solid State Physics
78 [ ] Sound

BEHAVIORAL OBJECTIVE REPORTING FORM (continued)

CODING HEADER



I.D. No. — The number assigned by the clerical staff at ESCOE to identify each objective, according to when it was received at ESCOE. Thus, if a particular LEA submitted 100 objectives on a certain day, and there are already 8000 objectives in the data bank, the objectives being submitted will carry the identification numbers 008001-008100.

Yr. — Year. The year in which the behavioral objective was written: 70, 71, or 72. Also to be written in the space provided below the coding header. This information was requested on the assumption that it will be necessary for future output concerning popularity and longevity of the objective.

T.N.C. — Type Numbers Column. Coding for use of the key-punching staff.

St. — State. The name of the state in which the participating LEA was located; each state was assigned a code number. Also to be written in below coding header.

City-School — The USOE code number assigned to each LEA. Name of LEA to be written in below header.

Lvl. — Level. A two-digit code number identifying the type of program the LEA provides and the level of the program at which the objective is offered. The first digit represents the program level and length and the second the year within the program when the objective is offered. See page 70 of this report for the list of programs represented and their code numbers. Also below coding header.

No. Tk. — Number Taking. The number of students to which the objective is (will be) taught during the school year. To be written in space below coding header as well.

[continued on next page]

BEHAVIORAL OBJECTIVE REPORTING FORM: CODING HEADER (continued)

Cap.Cl. Capability Classification. An in-house coding scheme to identify which of the items under this head on the reverse side of 12B have been checked, for example:

[X] Psychomotor -- 1

[ ] Psychomotor -- 0

[X] C 1.1 Knowledge of Specifics -- 1 1

etc.

See page 71 of this report for more detail on Capability Classifications.

Fl Field.
CR Major Group.
SG Subgroup.

The USOE codes for different occupational areas, for example:

Field of Study:	Trade & Industry	170000
Major Group:	Automotive Industries	170300
Subgroup:	Auto Mechanics	170302

This information is to be written in (in words) below the coding header as well.

BL Block.
MT Major Topic (Post-secondary only)**
UN Unit.

The coding scheme developed by ESCOE to identify the instructional segments within a subgroup. For instance, within the Subgroup Auto Mechanics 170302 the following Block is one of many in the Subgroup, each with its own Units:

Block	01	Power Transmission
Unit	01	Engine
	02	Transmission, Standard
	03	Transmission, Automatic

Blocks and Units were disseminated to LEAs as they became available. See the Appendices of this report for further information on Blocks and Units. (This information to be written in below coding header.)

**For objectives written by Post-secondary LEAs, the Block is the name of the course; the Major Topic is the major breakdowns of the course; the Unit shall be the units of instruction below the Major Topic. Block and Unit Breakdowns, with Major Topics, were constructed separately from secondary Blocks and Units.

BEHAVIORAL OBJECTIVE REPORTING FORM (continued)

Related Subject Discipline	Code numbers developed by ESCOE to identify which of the subjects listed on the reverse of 12B were checked as being "related" to the objective being submitted. The usefulness of such information may be seen, for example, in that if objectives are coded by Natural Science discipline, it is possible to determine the common mathematics capabilities sought by all occupational programs within or across LEAs.

SPACE BELOW CODING HEADER

In addition to the information to be written out as well as coded in the header, the names of the facilitator in the LEA and the instructor who wrote the objective are requested so that they may be consulted if necessary during the editing process. This information is not entered into the data bank.

CODES FOR "LEVEL"

Program Level	Year Offered	Type of Program Represented
0	0	Pre-vocational, including exploratory
1	1	Secondary, 1-year program
2	1	Secondary, 1st year of 2-year program
2	2	Secondary, 2nd year of 2-year program
3	1	Secondary, 1st year of 3-year program
3	2	Secondary, 2nd year of 3-year program
3	3	Secondary, 3rd year of 3-year program
4	1	Secondary, 1st year of 4-year program
4	2	Secondary, 2nd year of 4-year program
4	3	Secondary, 3rd year of 4-year program
4	4	Secondary, 4th year of 4-year program
5	1	Pre-post-secondary program
6	1	Post-secondary, 1st year of 1-year program
7	1	Post-secondary, 1st year of 2-year program
7	2	Post-secondary, 2nd year of 2-year program
8	1	Other

CAPABILITY CLASSIFICATION

Form #12B - Reverse

CAPABILITY CLASSIFICATION

Behavioral Objective Reporting Form

Psychomotor

[ ] Psychomotor (Check only if performance requires significant muscular activity)

Cognitive

(Check the one cognitive capability that best describes the mental activity involved)

Knowledge Acquisition

[ ] C1.1 Knowledge of Specifics

[ ] C1.2 Knowledge of Ways and Means of Dealing with Specifics

Knowledge Application

[ ] C2.1 Knowledge Application Without Alteration

[ ] C2.2 Knowledge Application With Alteration

Introduction

The performance of a behavioral objective infers or denotes certain abilities that may be classified, broadly speaking as "psychomotor," "cognitive," "affective," or combinations thereof. Psychomotor capabilities are those that are mostly muscular in nature although ensuing from cognitive capabilities. In general, psychomotor capabilities involve manipulating objects with various parts of the body. Cognitive capabilities are those that are primarily intellectual or mental in nature. In general, these capabilities involve acquiring and applying knowledge or information. Affective capabilities are those that are mostly emotional in nature. They generally involve acquiring or manifesting a feeling or attitude towards a particular object, person, or idea.

For further elaboration of the Capability Classification Scheme, see pages 62-69 of The Behavioral Objective Training Package.

OBJECTIVE EDITORIAL FORMS

Form D October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

LEA Editorial Reporting Form

LEA Name _____

Objective I.D. No(s). _____

Editorial Comments _____

Teacher's Name _____

OBJECTIVE EDITORIAL COMMENTS

The Behavioral Objective Editing Form allows the [illegible] to modify an objective which the Evaluation Service Center [illegible] incomplete or unclear. The notations on this form should be discussed with the Evaluation Service Center's field representative or the facilitator [illegible] your school. Please re-submit the modified Objective to ESCOE through your facilitator.

The Identification Number appearing on this form [illegible] the top right corner of Reporting Form #9, has no function other than identifying this Objective that it treats.

Teacher [illegible] Unit _____ Obj. Unit No. _____

CONDITIONS

- [ ] Good As Stated
- [ ] Not Stated
- [ ] These Are Not Conditions
- [ ] Conditions and Performance Need to be Separated
- [ ] Materials Not Specified or Incomplete
- [ ] Equipment and Tools Not Specified or Incomplete
- [ ] Other _____

PERFORMANCE

- [ ] Good As Stated
- [ ] Not Stated
- [ ] Not Stated in Behavioral Terms
- [ ] Performance and Extent Need To be Separated
- [ ] Does Not State What Learner Is To Do
- [ ] Is Not Clear What Learner Is To Do
- [ ] Other _____

CRITERIA

- [ ] Good As Stated
- [ ] Not Stated
- [ ] Not Clear
- [ ] Level of Acceptability Not Stated
- [ ] Level of Acceptability Not Clear
- [ ] Time Factor Not Stated
- [ ] Other _____

CHECK LIST ITEMS NOT STATED

CAPABILITY CLASSIFICATION

- [ ] Psychomotor
- [ ] Cognitive
- [ ] Affective

SUBJECT SOURCE DISCIPLINE

SYNTHESIZED OBJECTIVE FORM (#11A)

The Synthesized Objective Form is that form used by facilitators and teachers performing synthesis for ESCOE to record the SYNOB itself and varied information about the raw objectives from which the SYNOB was derived, as well as the numbers of the Blocks and Units upon which the SYNOB touches. In this way, each SYNOB is "cross-referenced," so to speak, with many relevant pieces of information. The instruction sheet for using the form, along with an 11A referenced to it by numbers, as well as a blank 11A, is included in this section.

SYNTHESIZED OBJECTIVE FORM (#11A)

Form # 11A

April 1972

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Synthesized Objective Form

SYNOB I.D. #

S

T	Mo.		Yr.	
1			7	2

SUBGROUPS					

Block		Unit		Unit		Unit		Unit		Unit	

1.00 CONDITIONS

Form #11A - Reverse

2.00 PERFORMANCE

3.00 EXTENT

I.D. #	Level	I.D. #	Level	I.D. #	Level	I.D. #	Level
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )

INSTRUCTIONS FOR USING THE SYNTHESIZED OBJECTIVE FORM

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

MEMORANDUM

From Alfred R. Rios Date April 1972

To ESCOE Synthesizers

Subject Instructions for Using Synthesized Objective Form #11A

(1.) Do not write in this space. ESCOE will number the SYNOB's prior to keypunching.

(2.) Fill in the month during which the SYNOB is written.
Example: April is [0|4]

(3.) A synthesized objective may include raw objectives from one, or more than one subgroup in a family of subgroups. Write in the subgroup number (s) to indicate which subgroups are included.
Some Examples:

1. A house framing SYNOB is strictly Carpentry, thus the subgroup number entered would be [1|7|1|0|0|1].
2. A silver soldering SYNOB would probably fall in Sheet Metal and also in Cutting and Welding. Thus, the numbers entered would be:
   [1|7|2|3|0|5]
   [1|7|2|3|0|6]

(4.) List the Block & Unit that a SYNOB touches on. Note: A SYNOB may cover more than one unit within a block and more than one block.
Example: If a curtain performance in a particular trade is common for block 5, units 11, 14, 15 and block 7, unit 2, then the entry would be:

Block	Unit	Unit	Unit	Unit	Unit
05	11	14	15		
07	02				

(5.) Start the fixed text at the left margin.

(6.) Write form change numbers in this space.

(7.) Write the variable text here.

(8.) Follow instructions (5.), (6.), (7.), for fixed and variable text format.
Note: The ideal synthesized objective describes only one performance. If more than one performance is described, the capabilities (psychomotor, cognitive, affective) required by the student to perform the stated actions must be essentially equivalent for performances indicated.

You are the subject area specialist, so the decision is yours. However, if reasonable doubt exists as to the similarity of performance, then do not combine the performances. Instead, write separate synthesized objectives accordingly.

(9.) Follow instructions (5.), (6.) & (7.)

(10a.) Record the I.D. # of each raw objective that is used in the synthesized objective.

(10b.) Write the level of each raw objective.

INSTRUCTIONS FOR USING THE SYNTHESIZED OBJECTIVE FORM: A SAMPLE #11A

Form # 11A - Sample

April 1972

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Synthesized Objective Form

(1) SYNOB I.D. #

S

(2)

T	Mo.		Yr.	
1			7	2

(3) SUBGROUPS

(4)

Block	Unit	Unit	Unit	Unit	Unit

(5) 1.00 CONDITIONS

Given an automatic stapling machine

(6) 1.11 Block and Decker

1.12 Skill

a blueprint, stock, and

1.21 Sample part

1.22 Instructions

(7)

2.00 PERFORMANCE (8)

3.00 EXTENT (9)

(10a) (10b)

I.D. #	Level	I.D. #	Level	I.D. #	Level	I.D. #	Level
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )
	( )		( )		( )		( )

SYNTHESIZED OBJECTIVE REPORTING FORMS

The Synthesized Objective Selection Reporting Form (Form A) and the Block and Unit Coverage by Synthesized Objectives (Form B) comprise the feedback loop from the LEAs to ESCOE, in response to the SYNOB Printouts and Matrices. Forms A and B appear on the same page in this section.

FORM A: SYNTHESIZED OBJECTIVE SELECTION REPORTING FORM

Form A provides an opportunity to indicate, for every SYNOB applicable to programs in that LEA, which form change(s), if any, it uses by inserting the appropriate form change number (found on the SYNOB printout). The LEA may indicate the need for additional form changes within a component (Condition, Performance, or Extent) of the SYNOB by simply writing in the space provided the additional change and designating it by the next highest form change number for that component. There is also space to make general comments on either the separate components or on the synthesized objective as a whole. For example, an LEA may disagree with a portion of the fixed test and indicate this in the place provided by inserting its own version. A sample of a completed Form A appears on the next page.

FORM B: BLOCK AND UNIT COVERAGE BY SYNTHESIZED OBJECTIVES

The SYNOB Matrix locates SYNOBS, by ID numbers, that "touch upon" specific Blocks and Units. Form B asks each LEA to indicate which portion of its course of instruction in the specified Subgroup still remains to be covered by SYNOBs. Thus a percentage figure in a particular square indicates what portion of this LEAs course (by Blocks and Units) has <u>not</u> been covered by SYNOBs. An X in a square means that unit of instruction is adequately covered by the ESCOE SYNOBs.

SYNTHESIZED OBJECTIVE FEEDBACK FORMS (continued)

SYNTHESIZED OBJECTIVE SELECTION REPORTING FORM (A) - COMPLETED SAMPLE

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Form A

October 1971

Synthesized Objective Selection Reporting Form

Date ...

School ....

Subgroup 170302

Instructor ....

Facilitator ....

SYNOB ID # 170302/001

Level 21

No. of Pupils 25

1•0 CONDITIONS [ ]

2•0 PERFORMANCE [ ] 2.22
[ ] ~~2.41~~
[ ] ~~2.42~~

3•0 EXTENT [ ]

GENERAL COMMENTS:

How well does this Synthesized Objective cover your course of instruction?

[ ] %

2.32 - Do not remove fit & replace wrist pins, R & R Connecting Rods & Install.
Wrist pins are better called Piston pins.
2.42 - Knurl should read Knurl Piston Skirts

The synthesized objective to which this particular Form A refers may be seen on page 14 of the Instruction Manual: Synthesized Objective Package, a separately bound appendix to this report.

FORMS A & B

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Form A

October 1971

Synthesized Objective Selection Reporting Form

Date _____

School _____ SYNOB ID # _____

Subgroup _____ Level _____

Instructor _____ No. of Pupils _____

Facilitator _____

1•0 CONDITIONS [ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

2•0 PERFORMANCE [ ] _____
[ ] _____
[ ] _____
[ ] _____

3•0 EXTENT [ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

GENERAL COMMENTS:

How well does this Synthesized Objective cover your course of instruction?

[ ] %

_____

_____

_____

_____

_____

_____

_____

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Form B

October 1971

LEA REPORTING FORM

Block and Unit Coverage by Synthesized Objectives

School _____ Date _____

Subgroup _____

UNITS

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
01																														
02																														
03																														
04																														
05																														
06																														
07																														
08																														
09																														
10																														
11																														
12																														
13																														
14																														
15																														

LEA REQUEST FORM (C)

The LEA Request Form focuses on an important facet of the ESCOE project: services to the LEAs. This form allows LEAs to request services of ESCOE in the form of copies of printouts and matrices (specified by Subgroup number), forms and materials, publications, or direct services to the LEA by the ESCOE field staff. The latter requests are written in the spaces at the bottom of the reverse side of the form. The ESCOE staff made it a point to respond to such requests immediately and to act on them as soon as it was feasible.

LEA REQUEST FORM (C)

Form C October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

LEA Request Form

Date _____

LEA Name _____

State _____

RAW OBJECTIVE PRINTOUTS

Own LEA Objectives

[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

Data Bank

[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

RAW OBJECTIVE MATRICES

[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

SYNTHESIZED OBJECTIVE MATRICES

[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

SYNTHESIZED OBJECTIVE PRINTOUTS

[ ] _____
[ ] _____
[ ] _____
[ ] _____
[ ] _____

OTHERS

(Please indicate number of copies requested in the parentheses.)

[ ] Form #12 (_____)

[ ] Form A SYNOB Selection Reporting Form (_____)

[ ] Form B LEA Reporting Form (Block and Unit Coverage by Synthesized Objectives) (_____)

[ ] Form C LEA Request Form (____)

[ ] SYNOB Package Instruction Manual (____)

[ ] Block and Unit Breakdown Lists (list below by subgroup)

_____(___) _____(___)
_____(___) _____(___)
_____(___) _____(___)
_____(___) _____(___)
_____(___) _____(___)

[ ] A Guide to Evaluation. Massachusetts Information Feedback System for Vocational Education. September 1969. (_____)

[ ] A Planning Document. Massachusetts and New York Evaluation Service Center for Occupational Education. May 1970. (____)

[ ] Working Paper No. 1. Massachusetts and New York Evaluation Service Center for Occupational Education. December 1970. (____)

[ ] Technical Report No. 1. Evaluation Service Center for Occupational Education. March 1971. (____)

[ ] _____(____)
[ ] _____(____)
[ ] _____(____)
[ ] _____(____)

BEHAVIORAL OBJECTIVE REPORTING FORM (#10)
AFFECTIVE CAPABILITY

This form is not to be filled out by individual teachers but cooperatively by departments with participating LEAs. Pages 52-57 of Technical Report Number 1, on affective capabilities, should be read before attempting to use this form.

Defining an affective capability as a positive or negative attitude or feeling toward an object, person, or idea, department members are to agree to at least five objects, persons, or ideas toward which their program is seeking to establish predetermined attitudes. By specifying a capability classification number within the Affective Capability Classification System, each department can express the extent or degree of feeling sought. The following are examples of items towards which attitudes might be sought: capatalism, democracy, tolerance of others, employers, self as a competent person, dishonesty, becoming a productive citizen, vocational education. The affective capability should be agreed to by all department members and sought for all students. It is assumed that these affective capabilities are "end program" objectives.

This form was not extensively used by ESCOE. It is included here in the hope that it may be useful to others intending to deal with the affective domain in education.

BEHAVIORAL OBJECTIVE REPORTING FORM: AFFECTIVE CAPABILITY (#10)

Form No. 10

MASSACHUSETTS AND NEW YORK EVALUATION SERVICE
CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

Affective Capability

Instructions

This Behavioral Objective Reporting Form is not to be filled in by individual teachers, but cooperatively by Departments within schools participating in the Evaluation Project.

Prior to filling out this form, each member of the professional staff of each participating Department is to read Affective Capabilities, pp. 52-57 of Technical Report Number 1, March 1971, Evaluation Service Center for Occupational Education, 85 North Whitney Street, Amherst, Massachusetts.

Defining an affective capability as a positive or negative attitude or feeling toward an object, person, or idea, Department staff members are to agree to at least five objects, persons or ideas toward which their program is consciously seeking to establish predetermined positive or negative attitudes. By specifying a capability classification number within the Affective Capability Classification System, each Department can express the extent or degree of positive or negative feeling sought in a uniform way among participating schools.

There are some fairly good examples offered in the Affective Capability Classification System. The following are examples of objects, ideas, or persons toward which positive or negative attitudes might be sought:

1. Capitalism
2. Democracy
3. Tolerance of Others
4. Employers
5. Self as a competent person
6. Dishonesty
7. Becoming a Productive Citizen
8. Vocational Education

The point is to have each Department agree to about five of the most important objects, ideas, or persons toward which their program is seeking to establish attitudes in a planned and predetermined way. The affective capabilities should be agreed to by all Department members, and sought for all students. It is assumed that these affective objectives are "end program" objectives.

The Evaluation Service Center will seek to measure the extent to which these objectives have been achieved in each participating school during 1972.

[N.B. The original Form No. 10 was six pages in all, with space for ten entries.]

Form No. 10

Behavioral objective Reporting Form

Affective Capabilities

State _____ Level _____

School _____ No. Taking Objective _____

Sub Group _____

Name and/or describe object, person or idea toward which affective behavior is sought.

1. _____

Feeling sought is ( ) positive or ( ) negative (check)

Check Affective Capability Classification

( ) A1.0 Receiving Capability
( ) A2.1 Responding Capability
( ) A2.2 Willingness Capability
( ) A3.1 Acceptance Capability
( ) A3.2 Full Commitment Capability
( ) A4.0 Values Organization Capability
(Please note that we are not seeking objectives classified as A4.0 at this time)

2. _____

Feeling sought is ( ) positive or ( ) negative (check)

Check Affective Capability Classification

( ) A1.0 Receiving Capability
( ) A2.1 Responding Capability
( ) A2.2 Willingness Capability
( ) A3.1 Acceptance Capability
( ) A3.2 Full Commitment Capability
( ) A4.0 Values Organization Capability
(Please note that we are not seeking objectives classified as A4.0 at this time)

VI

CRITERION-REFERENCED TESTS

CRITERION-REFERENCED TESTS

Background

The 1968 Amendment to the Federal Vocational-Technical Education Act mandated the development of state-wide evaluation systems for the administration and operation of federally supported vocational education. Parallel to this mandate the Research Coordinating Unit director for the Commonwealth of Massachusetts was in the process of completing some predesign activities for the development of a vocational-technical education management information system. By 1969 the predesign of this system had moved into the feasibility stages and specifications of the system were being developed.

At this stage New York State, which already had a fine centralized testing program, became interested in the philosophy espoused by the Massachusetts system and joined in the funding of a more intense feasibility test, which eventually became the source of the Performance Test Development Project. The Evaluation Service Center for Occupational Education (ESCOE) was funded in late 1970 and was housed in Amherst, Massachusetts, to test the feasibility of systems development based upon the principles of (1) local control and development of vocational curricula, (2) data-based feedback based upon tailored performance tests, and (3) curriculum description through terminal behavior objectives. The following report deals with a subcomponent of the ESCOE system which was designed to develop performance tests as software support for the ESCOE program.

Whats and Whys of Performance Testing

Performance testing is more a new reality as opposed to a new concept in educational testing. The concept grows out of the need felt by educators to sample actual performances of trainees as opposed to merely measuring symptoms of desired (or intended) competencies through paper and pencil tests and then relying upon the predictive powers (i.e., previously established associations of paper and pencil test scores to some hypothetical or observed criterion of competency in performance) of the test to infer competency acquisition. This felt need has grown in part from the inability of standardized achievement tests to deal with the unique objectives of a specific educational program, in part from the reportedly low correlations between measured skills and on-the-job (or in-the-shop) performances, and in part from the lack of realism involved in the paper and pencil testing situation.

Hence the performance test can be conceived of as a criterion-referenced test, in that (1) it is objective or criterion-centered (in one-to-one correspondence with the extent component of a stated objective); (2) it seeks to ascertain a subject's possession of a specific competency rather than to complete a comparison of the subject's competency level to a previously measured norm group; and (3) it usually requires a dichotomous decision as to whether the competency has been demonstrated. The performance test can be construed to be a special case of the criterion-referenced test in that there is a definite attempt to establish fidelity between the sample observation of the performance test and the performance being sampled.

In the evaluation of instructional programs in vocational-technical

education, the concept of performance testing is especially appropriate for several different reasons. First, performance tests can be hypothesized to produce more relevant and valid data concerning the instructional program output. Vocational program objectives tend to deal with competencies which require concurrent behavior changes across several domains of instructional objectives. Hence the accomplishment of a vocational objective may depend upon the development of a psychomotor skill, the mastery of a cognate process, the acquiring of some fundamental facts, and the development of a particular attitude. Unlike paper and pencil tests, which emphasize the measurement of the cognitive aspects of the performance or observations which emphasize process and action components, performance tests possess the potential to measure the mixture of behavior domains appearing in the desired performance. The performance test can therefore be argued to offer a valid means of measuring intended outcomes.

Second, performance tests produce product records which can be studied by teachers to diagnose the place in the instruction where a weakness may have occurred, aiding considerably their ability to analyze their instructional methods. Since the teacher can determine what aspects of the competency are missing, he can trace the point in his instruction where his objectives were not met. Also, since the product is concrete it can be kept longitudinally to analyze pupil growth at different stages of a multi-year program.

Third, the nature of the data produced by performance testing contains the flexibility demanded by the information needs of an evaluation system. The tests are constructed in one-to-one correspondence to stated objectives, thus enabling selection of test components from a data bank

situation in such a manner as to tailor the testing to the measurement of a unique set of program objectives. Since the tests are objective, specific comparisons of small aspects of an instructional program are possible. Since the tests are criterion-referenced, skill attainment in a particular area of interest can be ascertained; hence output of instructional programs can be described relative to percentage of skill development.

Restraints on Test Development

The design of the performance tests had to take into account both the philsophical and the operational structure of ESCOE. At times both of these structures served as restraining and occasionally frustrating hurdles for the test development team.

The philosophical nature of ESCOE provided the foundation of principles which are believed to have caused the performance tests to be unique. Since the objectives were generated by each local school, several very similar objectives appeared for a single behavior within a subject. Dr. David Berliner, now with the Far West Laboratory for Educational Research and Development, invented a process to state these similar objectives into a synthesized form accompanied by item changes providing for the unique characteristics of each objective. Thus, if enough objectives from different schools were collected to represent the curricula, by synthesizing those objectives one could arrive at a statement of all desirable behaviors within one curriculum.

The raw objectives based upon the curricula of each of the participating schools were synthesized to identify the major behaviors within a curriculum area. Hence, if the process worked ideally within a curricu-

lum area a linear set of behaviors was produced. The degree to which this process failed to produce such a linear array of behaviors constituted the first major restraint. If a singular listing of behaviors could not be gained, then singular test items could not be written.

A second philosophical principle which developed into a restraining factor was the decision to test only locally-maintained objectives within a specific program. This principle actually involved several implications for testing. First, a student would be tested only on the objectives maintained by the curriculum he was receiving. Therefore, the test items had to be described in a form indicating one-to-one correspondence with the synthesized objectives so that the local teacher could select only those items maintained for his course. This selection pattern, however, did increase the logical assumption that the tests possessed high validity in regard to the courses for which they were designed to measure outcomes. Second, each item had to be independent in its ability to be administered, since previous or adjoining items would not necessarily be administered with it. This item independence served as a restraint to test development in that objectives could not be clustered into tasks involving several test items.

The third restraint involved both philosophical and operational aspects in that two forms of scoring were preferred by the two cooperating states. Philosophically, the state coordinators differed on the location of scoring; this disagreement became a restraint to test development in that the items developed had to be scorable both in the local school and at a central test center. Three forms of scoring meeting this restraint were adopted, with choice of scoring form depending upon the nature of

the individual item. Two of the forms are based upon meeting the restraint with a single scoring process. The third form requires two different processes in order to meet the dual scoring restraint.

The scoring approaches requiring only one process are (1) the caliper or mechanically scored form and (2) the selection of correct response form. In the mechanically scored approach, several measured settings can be placed in a test scoring kit; the student or teacher records by label the setting which fits the final product. A key of correct setting labels can then be referred to, producing a dichotomous score for the product in terms of size tolerances. In the selection of correct response approach, correction keys can be applied directly to the student's response. In both cases either a central office or an individual classroom teacher can use the keys.

The third scoring form is not as simple, since two types of scores are required to meet the dual-use restraint. This scoring form is necessitated by the many tasks in the vocational curriculum which require expert observer judgment for the determination of performance quality. The two types of scoring needed for these items are (1) structured criteria for observation, and (2) pictorial records (color-coded to facilitate central scoring). The structured criteria for observation communicate to the individual teacher what aspects of the product to check in order to judge the performance successful. These criteria would be used in class. In the pictorial scoring process, camera angles have been described which would allow Polaroid pictures to be taken as records of the finished product. Color-coding the criteria checks would enable observers in a central location to determine the quality of the performance.

Each of these three approaches provides a means through which credible

and unbiased scores can be obtained. All of the processes can be scored by individual teachers and used within a classroom setting without the aid of a central scoring station. The fourth restraint to test development arises at this point, since it is impossible to arrive at an immediately usable set of norms through the current scoring system and the dichotomous item response without implementation of a program designed to gather enough data to norm the tests.

Two other restraints were present throughout the test development project, both operational in nature. First was the quality and quantity of the behavioral objectives themselves. Few if any of the curriculum areas were fully described, and the tests developed are limited to described curriculum. In two test areas, more items were developed and the synthesization process was repeated in order to sharpen the synthesized objectives. In these cases much curriculum had been left undescribed and the fill-in process aided considerably in explaining the descriptions. However, complete and multiple sets of items were not available from each school; therefore the test items may be lacking in content validity in cases of consultant-written items, may be representative of several behaviors, and may hence be difficult to test or represent only a small segment of the previously unwritten curriculum.

The second operational restraint was that of time. Although the budget was small, the seriously close deadlines in development work made time an even greater restraint. Creativity is sometimes especially evasive under the pressure of deadlines and within the constraints of administrative conflict. Still, the time dimensions were met in terms of design. Since schools were closed during the critical month of June, illustrations

of some items of the tests could not be produced; therefore only plans, item descriptions, materials descriptions and administration instructions could be developed.

A final restraint can be observed in the language in which the proposal was written. First, several terms apparently changed in meaning or in relevance to the project once development began. One apparent change occurred in the description of sixteen tests for four areas. One test for each level of a curriculum area cannot be developed so as to be equally relevant to all schools. Since the schools maintain different objectives, different items must be assigned to each school, even on the same level. Hence a more appropriate process becomes the development of an item bank from which tailored tests can be developed for each individual program. Second, the time restraints and the differences in the nature of curriculum required different kinds of tryouts, making the language of the proposal seem sometimes inappropriate.

Purposes of the Test Development Project

The design of the test development project included not only the goal of producing tests as products but also the goal of establishing feasibility of the test development effort across a broad spectrum of vocational-occupational curricula. For this reason four different areas of vocational curricula were selected for test development. These four areas differed in hypothetical difficulty of test development. The areas chosen were machine shop, woodworking and carpentry, electronics, and automobile mechanics. The automobile mechanics area was hypothesized to be the most difficult since manufacturers determined the curriculum, which therefore differed across competing manufacturers.

The performance tests were hypothesized to be sufficiently flexible to fulfill many purposes of a comprehensive evaluation system. Because of their proximity to the desired outcomes, performance tests were hypothesized to serve as (1) student diagnostic and prerequisite instruments, (2) diagnostic instruments for the analysis of instruction, (3) criterion instruments, (4) measures of classroom achievement, and (5) program success indicators. Each of these uses has already been piloted to some extent.

The performance tests as developed have several application conveniences. First, since the test items are paralleled to synthesized objectives, computer selection of test items or "synob" comparison of items can be used as a methodology for tailoring tests to instruction. Second, since the conceptual frames of the tests can be described, each test has built-in potential updating and extension by the classroom teacher.

Problems Encountered

Problems occurred from three viewpoints. First was the problem of lack of known direction, a handicap which often occurs in the area of development. Second was the problem of lack of perfection or completion of the objectives used as raw materials for the development of test items. Third was the problem of contending with dual scoring requirements and with several different kinds of program emphasis and structure.

The first problem has been emphasized recently with the development work done on criterion-referenced testing. From a conceptual point of view, the criteria previously used to determine the quality of norm-referenced tests can no longer be used for criterion-referenced tests. Since the measurement strategy of the criterion-referenced test and the perfor-

mance test is to determine the possession of either a skill or the capability to carry out an activity or process, the degree to which the test differentiates between subjects taking the test does nothing to indicate test quality. Unlike the norm-referenced test, in which measurement strategy is to distinguish between subjects, the performance test cannot be hypothesized to produce large differences across subjects nor can any specific level of difficulty be expected. Hence, average levels of difficulty and large differences between subjects do not indicate quality of the performance test.

In performance testing, some concepts of reliability still appear useful, while others appear to have lost their relevance. Reliability over time, or test-retest reliability, is still meaningful as long as the time between tests did not include opportunity for the subject to acquire the skill in question. Since performance tests are designed so that each item does not necessarily refer to the same skill or activity, reliability indices dealing with homogeneity of the test no longer appear to be relevant criteria for test quality.

The degree to which the items of a performance test cover the skills of an area and approximate actual performances required operates in a similar relationship to the performance test as that of a prediction index to a norm-referenced test. This degree of similarity might be compared to the concept of fidelity so often used in the recording industry.

The second problem involved the quality of the raw materials used. As should be expected, the synthesis process does not apply evenly to all areas and was not applied with the same consistency to each set of objectives. In the machine shop curriculum area, between 70 and 80 percent of

the content was described by the objectives. These objectives possessed adequate depth across skill areas to enable the synthesis process to produce clear synthesized objectives describing unique performances. The creation of items parallel to the synthesized objectives and possessing the independence and flexibility required by the philosophy of the system was a straightforward process.

In the woodworking area, between 60 and 75 percent of the content was described. Unfortunately, the synthesizers of the raw objectives failed to produce synthesized objectives which dealt only with single performances. Instead, the raw objectives were synthesized by similar or related behaviors and the product of this process was a matrix of similar performances (rather than a single performance) with several form changes denoting differences in conditions and extents across schools. Since these products seemed usable, the decision was made to produce a matrix of test items generated in one-to-one correspondence to the performances included in each synthesized objective. This decision was the source of some time lost due to the expanded number of test items which had to be written; however, this increase in items was accompanied by a large increase in test specificity, which in turn increases the degree to which the performance test can be tailored to fit a given instructional program without any noticeable loss of efficiency of the item banking process.

Due to the variance of material and the limited scope of the objectives developed for the electronics curriculum area, a decision was made to rewrite many of the synthesized objectives. For more than one-half of the contract period two of the test development team members struggled to find a format within which the scope of the electronics curriculum could

be described. By expanding the number of conditions it was found that classes of performance could be described by synthesized objectives. Hence, through considerable redesign and a small set of compromises of the synthesis process involving uniqueness of performances and allowance of performance form changes, subcollections of electronics objectives could be written which would allow test development along similar conceptual lines as those followed in the development of the machine shop test. Results of the test development effort again produced item banks, as in the two previous test areas, with the items possessing similar relationships to the synthesized objectives.

In the area of automobile mechanics, less than 50 percent of the content was described by the raw objectives. Many of the subdivisions of content were too sparse to allow for the development of synthesized objectives. In addition, the synthesis process applied seemed irregular across blocks and units. The level of abstraction of behaviors described by the raw objectives and the interdependence of the performances raise questions concerning the appropriateness of the synthesis process in this area. Certainly, the limited number of usable synthesized objectives and the necessary revisions of the existing objectives made the decision to rewrite the objectives essential. Revision of the curriculum descriptions were made in relationship to the job orientation of the curriculum. Test items were written around standard mechanics tasks as described in the automobile mechanics curriculum. In some of these items, synthesized objectives are tested in a format which includes a cluster of the objectives provided by the ESCOE system. In other items, only parts of ESCOE-produced objectives are included in the new synthesized objectives being

tested. Once a test item has been constructed, the process can be reversed so that system capability as achieved in the other three test areas can be gained. Because of their time-consuming nature, tasks in the curriculum such as disassembly and reassembly of a motor or transmission were not included as individual test items. Instead, either sample tasks from the large unmanageable task or written or pictorial selection items were created to test these phases of the curriculum.

The third problem area encountered was the difficulty involved in the existence of two separate scoring requirements and in the time limitations of the test development project. It was not always possible to produce useful in-class scoring of the performance item and credible, objective centralized scoring of the performance item through application of the same scoring process. Therefore some items are suspected to produce more useful scores in the classroom than in a central scoring situation, while the reverse is suspected of other items. Only time and study of the tests can alter or affirm these suspicions. It is unfortunate that systematic refinement of the woodworking, electronics, and automobile mechanics tests is not planned to occur along the same lines as those applied to the machine shop test.

Development and field test procedures, item bank descriptions, recommended analysis procedures, and uses for the four tests are contained in the individual test development reports.

The four tests which have been developed and are appended as separate volumes to this report are the following:

Performance Test for Auto Mechanics
by Jim C. Fortune
Center for Educational Research, School of Education
University of Massachusetts, June 1972

Criterion-Referenced Item Banking in Electronics
by William Phillip Gorth and Hariharan Swaminathan
Center for Educational Research, School of Education
University of Massachusetts, June 1, 1972

Performance Test Development in Machine Shop
by Jim C. Fortune
Center for Educational Research, School of Education
University of Massachusetts, June 1972

Woodworking Objective and Test Item Bank
by Ronald K. Hambleton, Center for Educational Research
School of Education, University of Massachusetts
and Francis Olszewski, Smith Vocational High School
Northampton, Massachusetts.

Copies of the performance tests will be sent with this report as separate volumes.

VII

APPENDICES

APPENDIX A

BLOCKS AND UNITS

	For Example:	
Field of Study		Technical
Major Group		Engineering Technology
Subgroup		Civil Technology
Block		Elementary Surveying
Major Topic[1]		Taping
Unit		Correction for long or short tape

"The Blocks and Units serve as categories within a subgroup by which objectives are classified and coded so that they may be stored and retrieved systematically. Each breakdown list is the result of at least two instructors from different LEAs working together in identifying the Blocks and Units of instruction for a particular program. It should be made clear that this breakdown is an arbitrary list to be used for the ESCOE data system. There is no suggestion that this is the 'correct' breakdown for any program. The Block and Unit Breakdowns provide a common language through which LEAs may share behavioral objectives and still maintain in their o n LEA different descriptions, if they so desire.

"The Block and Unit lists are always open-ended. If an objective cannot be fitted into one of the existing Blocks and/or Units, another term describing the stated performance may be used."

from Memo to ESCOE Facilitators, June 6, 1972

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[1]Because of the differing depth and comprehensiveness in secondary and post-secondary programs, a Block in a post-secondary curriculum description is much broader than a Block at the secondary level: it is essentially equivalent to a semester course. Specificity in a post-secondary program equivalent to specificity in a Block at the secondary level is to be found in the Major Topic. The Major Topic category is included in the example given here; the objective to which this breakdown applies was written for a post-secondary area.

Subgroups for Which Blocks and Units Have Been Developed

SECONDARY

USOE CODE	SUBGROUP
070302	Practical Nursing
170301	Auto Body & Fender
170302	Automobile Mechanics
170701	Interior Decorating
170702	Window Display
170703	Product Design
170799	Other Commercial Art Occupations
171001	Carpentry
173601	Millwork and Cabinet Making
173699	Other Woodworking Occupations
171300	Drafting Occupations
171401	Industrial Electrician
171002	Electricity
171502	Electronics
171901	Composition, Make-up, Typeset
171902	Printing Press Occupations
171903	Lithography
171905	Silk Screening
171999	Other Graphic Arts Occupations
172302	Machine Shop
172305	Sheet Metal
172306	Welding and Cutting
172397	Precision Sheet Metal
172398	Metal Fabrication

POST-SECONDARY

USOE CODE	SUBGROUP
030101	Principles of Accounting
070301	Associate Degree Nursing
160106	Civil Technology
160113	Mechanical Technology

SECONDARY (continued)

USOE CODE	SUBGROUP
172399	Other Metal Fabrication
172901	Baking
172902	Chef/Cook
172903	Meat Cutter
172999	Other Meat Cutter Occupations
172904	Waiter/Waitress
172602	Cosmetology
171007	Pipefitting
171007	Plumbing
172301	Foundry

BLOCKS AND UNITS FOR PRACTICAL NURSING: SECONDARY LEVEL

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 1 Of 5 — Block and Unit Breakdown — March 1972 Secondary

Subgroup Practical Nursing 07.0302

Code	Block	Code	Unit
01	HUMAN BODY		
		01	General Plan
		02	Cells, Tissues, Membranes
		03	Skin
		04	Bones, Muscles
		05	Digestive System
		06	Heart
		07	Blood Vessels
		08	Blood
		09	Lymphatic System
		10	Respiratory System
		11	Urinary System
		12	Endocrine System
		13	Reproductive System
		14	Brain
		15	Spinal Cord and Nerves
		16	Sensory System
02	MICROBIOLOGY		
		01	Definition
		02	History
		03	Characteristics
		04	Classification
		05	Pathogenic Microorganisms
		06	Environment for Growth & Reproduction
		07	Methods of Destruction
		08	Infection
		09	Body Defenses
		10	Environmental Control
03	NUTRITION		
		01	Balanced Diet
		02	Carbohydrates
		03	Proteins
		04	Fats
		05	Energy Requirements
		06	Minerals
		07	Vitamins
		08	Digestion
		09	Age Group Needs
		10	Planning Menus
		11	Cooking
		12	Food and Health
		13	Cultural Patterns
		14	Care and Protection
		15	Fads and Fallacies

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 2 Of 5 — Block and Unit Breakdown — March 1972 Secondary

Subgroup Practical Nursing 07.0302

Code	Block	Code	Unit
04	FUNDAMENTALS		
		01	Guides for Action
		02	Environment
		03	Medical Asepsis
		04	Body Mechanics
		05	Beds
		06	Posture and Exercise
		07	Admissions and Discharges
		08	Recording and Reporting
		09	Observation
		10	Vital Signs
		11	Physical Examination
		12	Hygiene
		13	Comfort Measures
		14	Feeding
		15	Breathing
		16	Elimination
		17	Diagnostic and Medical Measures
		18	Wound Care
		19	Bandages and Dressings
		20	Heat and Cold Applications
		21	First Aid
		22	The Dying and Dead
		23	Medications
05	THE PRACTICAL NURSE		
		01	Definition
		02	The Student Nurse
		03	Problem Solving Techniques
		04	History
		05	Nursing Education
		06	The Health Team
		07	Patterns of Nursing
		08	The Hospital
		09	Interpersonal Relationships
		10	Spiritual & Cultural Considerations
		11	Ethics
		12	The Law
		13	Organizations
		14	Job Opportunities
		15	Continuing Education
06	HUMAN BEHAVIOR		
		01	Rationale
		02	Terminology
		03	The Human Being
		04	Influences

BLOCKS AND UNITS FOR PRACTICAL NURSING: SECONDARY LEVEL (continued)

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 3 Of 5 — Block and Unit Breakdown — March 1972 Secondary

Subgroup Practical Nursing 07.0302

Code	Block	Code	Unit
06	[continued]	05	Personality
		06	Learning
		07	Emotions and Behavior
		08	Adjustment Patterns
		09	Behavioral Problems
		10	Illness
07	GROWTH AND DEVELOPMENT		
		01	Rationale
		02	Terminology
		03	Nature
		04	Familial Influences
		05	Child Rearing
		06	Prenatal Period
		07	Neo-Natal (0-4wks)
		08	Infant (4wks-1yr)
		09	Toddler (1yr-3yrs)
		10	Pre-schooler (3yrs-6yrs)
		11	School Age (6yrs-10yrs)
		12	Pre-puberty (10yrs-12yrs)
		13	Adolescence (12yrs-18yrs)
		14	Young Adulthood
		15	Middle Age
		16	The Aged
		17	Deterrants to Normal Growth and Development
08	PHARMACOLOGY		
		01	Drug Standards and Legislation
		02	Sources
		03	Various Forms
		04	Effects
		05	Abbreviations
		06	Arithmetic
		07	Weights and Measures
		08	Fractional Dosages
		09	Solutions
		10	Syringes
		11	Rules in Handling Medicines
		12	Classification
09	CARE OF ADULTS		
		01	Basic Concepts
		02	Nursing Care Plan
		03	Allergies
		04	Surgery
		05	Cancer
		06	Prolonged Illness

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 4 Of 5 — Block and Unit Breakdown — March 1972 Secondary

Subgroup Practical Nursing 07.0302

Code	Block	Code	Unit
09	[continued]	07	The Geriatric
		08	Rehabilitation
		09	Respiratory Disorders
		10	Disorders of the Blood
		11	Cardio-vascular Disorders
		12	Gastro-Intestinal Disorders
		13	Urinary Disorders
		14	Disorders of the Reproductive System
		15	Endocrine Disorders
		16	Neurological Disorders
		17	Musculo-skeletal Disorders
		18	Eye and Ear Disorders
		19	Disorders of the Skin
		20	Mental Illness
		21	Emergency and Disaster
10	DIET THERAPY		
		01	Hospital Diets
		02	Modification of Diets
		03	Weight Control
		04	High Caloric
		05	Diabetic
		06	Protein Controlled
		07	Gastro-Intestinal Disorders
		08	Cardio-vascular Disorders
		09	Renal Disorders
		10	Allergies
		11	Metabolic Disorders
		12	Pregnancy
		13	Lactation
		14	Newborn and Infants
		15	Children and Adolescents
		16	Adults
11	DRUG THERAPY		
		01	Legal Responsibilities
		02	Limitations
		03	Anesthetics
		04	Anti-neoplastics
		05	Anti-infectives
		06	Skin Disorders
		07	Blood Disorders
		08	Cardio-vascular Disorders
		09	Respiratory Disorders
		10	Gastro-Intestinal Disorders
		11	Genito-Urinary Disorders
		12	Endocrine Disorders

BLOCKS AND UNITS FOR PRACTICAL NURSING: SECONDARY LEVEL (continued)

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EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

March 1972
Secondary

Subgroup Practical Nursing 07.0302

Code	Block	Code	Unit
11	[continued]	13	Neurological Disorders
		14	Musculo-skeletal Disorders
		15	Eye Disorders
		16	Ear Disorders
12	MATERNITY		
		01	Prenatal Development
		02	Preparation
		03	Problems of Pregnancy
		04	Labor
		05	Delivery
		06	Post-partum
		07	Newborn
		08	Health Regulations
		09	Family Planning
13	PEDIATRICS		
		01	Child Welfare
		02	Child Care
		03	Healthy Child
		04	Ill Child
		05	Hospitalization
		06	Disorders of Infant
		07	Disorders of Toddler
		08	Disorders of Preschoolar
		09	Disorders of School ager
		10	Disorders of Adolescent
		11	Special Needs and Abnormalities

BLOCKS AND UNITS FOR ELECTRONICS: SECONDARY LEVEL

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 1 Of 2

Block and Unit Breakdown — April 1972, Secondary

Subgroup Electronics — 17.1502

Code	Block	Code	Unit
01	PASSIVE CIRCUITS-DC		
		01	Introduction to Electricity
		02	Atomic Structure
		03	Static Electricity
		04	Electrical Terms and Units
		05	Batteries and Cells
		06	Series Circuits
		07	Parallel Circuits
		08	Complex Network Circuits
		09	Ohm's Law
		10	Kirchoff's Laws
		11	Power
		12	Overload Protection
		13	Conductance
		14	Magnetism
		15	Electromagnetism
		16	Inductance
		17	Capacitance
		18	DC Motors
		19	DC Generators
		20	Basic Meter Circuits
		21	Test Equipment
02	PASSIVE CIRCUITS-AC		
		01	AC Current and Voltage
		02	AC Generators
		03	AC Meter
		04	Phase
		05	Reactance
		06	Impedance
		07	AC Power
		08	Transformers
		09	Series AC Analysis
		10	Parallel AC Analysis
		11	Complex AC Analysis
		12	Resonance
		13	Band Pass & Band Reject Filters
		14	Time Constants
		15	Test Equipment
03	ACTIVE CIRCUITS		
		01	Active Devices
		02	Amplifiers
		03	Oscillators
		04	Detectors
		05	Power Supplies
		06	Pulse Circuits
		07	Integrated Circuits
		08	Transducers
		09	Test Equipment

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Page 2 Of 2

Block and Unit Breakdown — April 1972, Secondary

Subgroup Electronics — 17.1502

Code	Block	Code	Unit
04	ELECTRONIC SYSTEMS		
		01	Receivers
		02	Transmitters
		03	Phonographs
		04	Tape Recorders
		05	Television
		06	Wave Propagation
		07	Microwaves
		08	Induction Heating
		09	Ultrasonics
		10	Computer Technology
		11	Control Circuits
		12	Antenna System
		13	Radar
		14	Sonar
		15	Radio Direction Finder
		16	LORAN
		17	Test Equipment
		18	Modulation
		19	Communication System
05	SHOP PRACTICES		
		01	Soldering
		02	Tools
		03	Machines
		04	Printed Circuits
		05	Wiring
		06	Cabling
		07	Electronic Equipment Fabrication
		08	Splicing
		09	Departmental Operation
		10	Chassis
		11	Preventive Maintenance
		12	Basic Troubleshooting Techniques
		13	Electronic Drafting

BLOCKS AND UNITS FOR ASSOCIATE DEGREE NURSING
POST-SECONDARY LEVEL

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Sheet 1 of 4 — MAJOR TOPIC AND UNIT BREAKDOWN — March 1972 Post-Secondary

Code 07 Field of Study Health Occupation Education

Code 03 Major Group Nursing

Code 01 Subgroup Associate Degree Nursing

Code 10 Block Fundamentals of Nursing I

Code 01 Major Topic Nursing as a Science

Code 01 Unit Introduction to Nursing

02 Unit Nursing in the Contemporary World

03 Unit Problem Solving

04 Unit Nursing Practice

05 Unit Nursing Care Plan

Unit

Unit

Unit

Unit

Code 02 Major Topic Concepts of Health

Code 01 Unit Definition of Health

02 Unit Human Needs in the Life Cycle

03 Unit Stress as Related to Health

04 Unit Maintenance of Health Today

05 Unit Nurses Role in Health Teaching

Unit

Unit

Unit

Unit

NOTE: If there are more than nine units within a major topic, cross out the next lower major topic and continue with units.

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Sheet 2 of 4 — MAJOR TOPIC AND UNIT BREAKDOWN — March 1972 Post-Secondary

Code 07 Field of Study Health Occupation Education

Code 03 Major Group Nursing

Code 01 Subgroup Associate Degree Nursing

Code 10 Block Fundamentals of Nursing I

Code 03 Major Topic Methods of Communication

Code 01 Unit Verbal Behavior

02 Unit Non-Verbal Behavior

03 Unit Interpersonal Relationships

04 Unit Group Dynamics

Unit

Unit

Unit

Unit

Unit

Code 04 Major Topic Metabolism - Nutrition

Code 01 Unit Normal Nutrition

02 Unit Fluids and Electrolytes

03 Unit Modifications of the Normal Diet

04 Unit Techniques of Feeding

Unit

Unit

Unit

Unit

Unit

NOTE: If there are more than nine units within a major topic, cross out the next lower major topic and continue with units.

BLOCKS AND UNITS FOR ASSOCIATE DEGREE NURSING: POST-SECONDARY LEVEL (continued)

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Sheet 3 of 4 — MAJOR TOPIC AND UNIT BREAKDOWN — March 1972 Post-Secondary

Code 07 Field of Study Health Occupation Education

Code 03 Major Group Nursing

Code 01 Subgroup Associate Degree Nursing

Code 10 Block Fundamentals of Nursing I

Code 05 Major Topic Metabolism - Elimination

Code 01 Unit Normal Elimination Patterns

02 Unit Deviations from Normal Elimination

03 Unit Collection of Specimens

Unit

Unit

Unit

Unit

Unit

Unit

Code 06 Major Topic Environmental Safety

Code 01 Unit Oxygen Requirements

02 Unit Nursing Assessment

03 Unit Personal Hygiene

04 Unit Body Mechanics

05 Unit Asepsis (Medical and Surgical)

06 Unit Environmental Hazards

07 Unit Psychological Support

Unit

Unit

NOTE: If there are more than nine units within a major topic, cross out the next lower major topic and continue with units.

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Sheet 4 of 4 — MAJOR TOPIC AND UNIT BREAKDOWN — March 1972 Post-Secondary

Code 07 Field of Study Health Occupation Education

Code 03 Major Group Nursing

Code 01 Subgroup Associate Degree Nursing

Code 10 Block Fundamentals of Nursing I

Code 07 Major Topic Environmental Therapy

Code 01 Unit Wounds, Healing

02 Unit Inflammation and Infection

03 Unit Nursing Diagnosis

04 Unit Supportive & Comforting Measures

05 Unit Oxygen Therapy

06 Unit Physical Therapy

07 Unit Family Involvement

Unit

Unit

Code 08 Major Topic Pharmacology

Code 01 Unit Legal Aspects

02 Unit Pharmaceutical Preparations

03 Unit Physiologic Action of Major Drug Categories

04 Unit Metric and Apothecary System

05 Unit Computation of Dosages

06 Unit Administration

Unit

Unit

Unit

NOTE: If there are more than nine units within a major topic, cross out the next lower major topic and continue with units.

APPENDIX B

DATA STORAGE SYSTEM

The storing, sorting, and listing of the raw and synthesized objectives was done primarily at the University of Massachusetts in Amherst on its CDC3600 and CDC3800 computers. All programs were initially written in FORTRAN. In the fall of 1971, the raw objective data bank was transferred to the Massachusetts Department of Education, Research and Development Center. Some COBOL programs have been written there.

To make up the data bank of raw objectives, approximately 10,300 objectives were written onto data forms by the facilitators. Cards were keypunched from these forms, read into the computer, and stored in variable length records on magnetic tape. Each objective on the tape includes an identification number and codes as to school and subject area, as well as the written objective itself. Also included in the objective records are code numbers for the related subject areas, the number of students taking a particular objective, and the level within the school program where the objective is first taught.

The tape of raw objectives was sorted and major computer printouts in order of raw objective I.D. number, subject area (field, group, subgroup, block, and unit) and school were provided. A program was also written to make up a matrix by school and subgroup telling how many objectives in each block and unit were received from a particular school. Other minor programs for finding errors in the data, for

getting simple statistical information from the bank of objectives, and for listing only specific sections of the bank of objectives were written and run.

Four subgroups of the raw objectives amounting to 2571 objectives have been synthesized. The resulting 343* synthesized objectives were punched onto cards, read into the computer, and stored on magnetic tape. A computer program for listing this tape in the desired format and one which will make up a matrix of the synthesized objective I.D. numbers in each subgroup, block, and unit have been written and run.

In the future both states will continue to use the banks of raw and synthesized objectives. A set of punched cards for each state is being prepared, and Massachusetts and New York will, therefore, initially have identical copies of the entire data bank. The data banks will be in use in New York at the Hudson Valley ESCOE, Hudson Valley Community College, in Troy, and in Massachusetts at the MISOE project, Division of Occupational Education, Massachusetts Department of Education in Winchester.

* as of August 1971

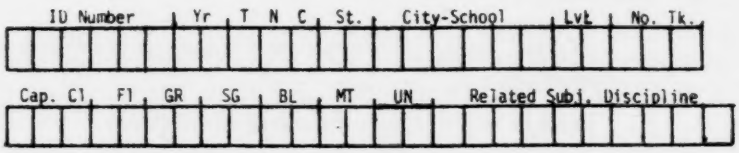
DATA STORAGE SYSTEM: CODING HEADER

The function of the coding header -- accompanying every objective submitted to ESCOE --is to provide code numbers for the various dimensions by which objectives may be retrieved from the data bank.

Form #12B January 1972

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form



LEGEND:

ID Number -	number assigned to every objective by ESCOE staff, in the order in which it is received at ESCOE; e.g., the sixty-seventh objective received is coded as #000067.
Year -	the year in which the objective was written
TNC -	[for keypunching use]
St. -	state, i.e., New York or Massachusetts, in code
City-School -	USOE code number (6 digits) assigned to each LEA
Level -	a two-digit code number identifying program length and level and the year of study in which the objective is offered
No.Tk. -	number taking, i.e., the number of students to which this objective is taught in a school year
Cap. Cl. -	capability classification, i.e., psychomotor, cognitive, or affective, in code
Fl -	Field
GR -	Major Group
SG -	Subgroup
BL -	Block
MT-	Major Topic
UN -	Unit

THE PROCESS OF RECEIVING AND STORING OBJECTIVES AT ESCOE

1. Objectives received at ESCOE (by mail or hand-carried)
2. secretary scans objectives:
   a. if adequate (legible, complete, etc.) step 3 is initiated
   b. if inadequate, objectives referred to editorial staff who either return the objectives to the LEA with comments or make minor adjustments and send to step 3
3. secretary:
   a. stamps date on first and last objectives of each subgroup received
   b. stamps ID number on each objective
   c. enters data in logbook (number of objectives in a subgroup received, subgroup code number, ID number of first and last objectives in subgroup, date, etc.)
4. objectives labeled "to be coded" and filed by ID number within subgroup and LEA
5. staff:
   a. codes objectives
   b. logs out objectives to be keypunched
   c. labels objectives "to be keypunched" and files
6. objectives taken to be keypunched
7. objectives returned after punching and:
   a. logged in by person returning them
   b. labeled "have been keypunched" and filed.

APPENDIX C

ABSTRACTS OF ESCOE PUBLICATIONS

Technical Report Number 1 (March 1971) - A brief description of the Project, a coding and reporting guide manual, a performance objective guide, and a related bibliography.

Instruction Manual: Synthesized Objective Package - A prototype training package guide for the development and use of synthesized objectives; complete information on the feedback loop between the LEAs and ESCOE. October 1971.

Behavioral Objective Training Package - A complete introduction to ESCOE and behavioral objectives, including the process of submitting objectives to ESCOE; for the use of facilitators and teachers affiliated with ESCOE. November 1971.

Programmed Text - A self-instructual guide for learning to write and recognize well-written behavioral objectives.

APPENDIX D

GLOSSARY

Affective Domain - The sphere of learning that deals with feelings or attitudes; one of the Capability Classifications.

Behavioral Objective - A statement describing in observable terms what a student will be able to do after successfully completing a prescribed unit of instruction.

Block - Largest instructional segment within a Subgroup.

Capability Classification - A system for coding the abilities demonstrated in the performance of a behavioral objective, namely, psychomotor, cognitive, or affective capabilities, or combinations thereof; domain.

Category Breakdown - The terms ESCOE uses to categorize occupational programs of study: Field of Study, Major Group, Subgroup, Block, Major Topic, Unit.

Coding Header - The numerical tabulation of data on Behavioral Objective Reporting Form (#12B), by which an objective is classified and identified, as, for instance, the LEA writing the objective, the year in which it was written, the Block and Unit, etc.

Cognitive Domain - The sphere of learning that deals with mental and intellectual capabilities.

Conditions - The exact circumstances, e.g., meterials and procedures (or restrictions on them), under which an objective is performed; one of the three components of a behavioral objective (see also Extent, Performance).

Criterion-Referenced Test - The evaluation instrument used to assess the degree to which an individual meets predetermined standards on specific criteria statements (behavioral objectives).

Domain - An educational sphere of learning, i.e., Affective, Cognitive, Psychomotor.

ESCOE - Evaluation Service Center for Occupational Education.

Extent - The criteria--quality, tolerances, accuracy, percentage of correct answers, etc.--used to measure the performance; one of the three components of a behavioral objective (see also Conditions, Performance).

Facilitator - ESCOE liaison person in a local educational agency.

Family - A collection of allied Subgroups making up a Trade.

GLOSSARY (continued)

Feedback - The process of communicating the products of the system to the users and by which the users react to the products.

Field of Study - Broadest category of occupational classification, e.g., Trade & Industry, Health Occupations. (See Category Breakdown)

Fixed Text - That portion of a synthesized objective that is not optionable, or does not vary.

Form Changes - The options available within a synthesized objective; the variable text.

LEA - Local Education Agency - A school or group of schools affiliated with ESCOE that operates under one administrative organization, such as a high school,trade school, vocational-technical school, BOCES center, community college, skills center, etc.

Major Group - Classification of occupational programs within a "Field of Study"; e.g., with Health Occupations: Dental Services, Medical Services, Nursing, etc. (See Category Breakdown)

Major Topic - A division with a Block, created for the particular characteristics of post-secondary programs. (See Category Breakdown).

Norm-referenced standards - A testing approach in which students' performances are compared to the performances of others in the same reference group, such as achievement tests and aptitude tests. These tests provide no direct indication of the individual's degree of proficiency in relation to specific criteria.

Performance - The exact observable behavior a student who has mastered the requirements of an objective will manifest; one of the three components of a behavioral objective (see also Conditions, Extent).

Printout - Printed computer output.

Psychomotor Domain - The sphere of learning that deals with physical skills which require muscular coordination and varying degrees of strength.

RAWOB - Raw Objective - A behavioral objective, before synthesis.

Subgroup - Occupational programs within a Major Group classification. (See Category Breakdown).

GLOSSARY (continued)

SYNOB - Synthesized Objective - Raw objectives similar in performance combined into one statement

Unit - Instructional segment within a Block or Major Topic by which an objective is classified (see Category Breakdown).

U.S.O.E. - United States Office of Education; ESCOE used U.S.O.E. code numbers for Field of Study, Major Group, and Subgroup to identify trades, academic subjects, occupational areas, etc.

Variable Text - That portion of a synthesized objective which is optionale; the form changes.

APPENDIX E

BIBLIOGRAPHY

Alshuler, Albert S.; Tabor, Diane; Mackentire, James. Teaching Achievement Motivation. Middletown, Conn.: Education Ventures, Inc., 209 Court Street, 1970.

Bloom, Benjamin S. Learning for Mastery Evaluation Comment. Los Angeles: Center for the Study of Evaluation of Instructional Programs. Vol. I, No. 2, May 1968.

Bloom, Benjamin S. (Ed.); Englehart, Max D.; Hill, Walter H.; Furst, Edward J.; Krathwohl, David R. Taxonomy of Educational Objectives: The Classification of Educational Goals; Handbook I: Cognitive Domain. New York: David McKay Co., Inc. 1971.

Bloom, Benjamin S.; Hastings, J. Thomas; Madaus, George F. Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill Book Co. 1971.

Briggs, Leslie J. Handbook of Procedures for the Design of Instruction. American Institution for Research, 135 N. Bellefield Ave., Pittsburgh, Pa. 15213. ($5.00)

Brawer, Florence B. Personality Characteristics of College and University Faculty. Monograph Series #3 Clearinghouse for Junior College Information/American Association of Junior Colleges, 1315 16th Street, N.W., Washington, D.C. 20036. 1968. ($2.00 p.b.)

Brawer, Florence B. & Cohen, Arthur M. Measuring Faculty Performance. Monograph Series #4 ERIC Clearinghouse for Junior College Information/ American Association of Junior Colleges, 1315 16th Street, N.W., Washington, D.C. 20036. 1968. ($2.00 p.b.)

Carnegie Commission on Higher Education. The Open Door Colleges. McGraw-Hill Book Co., Hightstown, N.J. 08520. June 1970. ($1.00 p.b.)

Chickering, Arthur. Education & Identity. Higher Education Series. Jossey-Bass, 615 Montgomery Street, San Francisco, Calif. 94111. 1971. ($9.50)

Climate and Process of Teaching and Learning; An Issue of Improving College and University Teaching. Autumn 1968.

Coding and Writing Test Items. Tucson, Arizona: Educational Innovators Press. 1970.

Conroy, William G. Jr. (Ed.). A Guide to Evaluation: Massachusetts Information Feedback System for Vocational Education. Woburn, Mass.: The Massachusetts Vocational Education Research Coordinating Unit. September 1969.

BIBLIOGRAPHY (continued)

Conroy, William G. Jr.& Cohen, Louis A. A Planning Document. Albany: University of the State of New York, Bureau of Education Research. May 1970.

Davis, James H. Group Performance. Menlo Park, Calif.: Addison-Wesley Publishing Co. 1969.

Developing and Writing Behavioral Objectives. Tucson, Arizona: Educational Innovators Press. 1970.

Eble, Kenneth. The Recognition and Evaluation of Teaching. Director Project to Improve College Teaching, 1259 E. South Temple, Salt Lake City, Utah 84102. 1971. ($1.00 p.b.)

ESCOE Staff. Technical Report Number 1. Amherst, Mass.: Evaluation Service Center. March 1971.

ESCOE Staff. Working Paper Number 1: Behavioral Objective Reporting Procedure. Albany: University of the State of New York, Bureau of Education Research. December 1970.

Evaluation Design. Tucson, Arizona: Educational Innovators Press. 1970.

Forshay, Arthur W. Curriculum for the 70's: An Agenda for Invention. Washington, D.C.: National Education Association. 1970.

Hersey, Paul & Blanchard, Kenneth H. Management of Organizational Behavior Utilizing Human Resources. Englewood Cliffs, N.J.: Prentice-Hall. 1969.

Johnson, Stuart & Rita. Developing Individualized Instructional Material. Westinghouse Learning Press, 2680 Hanover Street, Palo Alto, Calif. 94304. 1970. ($3.00 p.b.)

Junior College Research Review. Teaching Evaluation-Toward Improving Instruction. ERIC Teaching Evaluation, American Association of Junior Colleges, One Dupont Circle, N.W., Washington, D.C. 20036. ($3.00/yr.)

Kelly, Frances M. & Connolly, John. Orientation for Faculty in Junior Colleges. Monograph Series #10. American Association of Junior Colleges, One Dupont Circle, N.W., Washington, D.C. 20036. ERIC Clearinghouse. 1970. ($3.00 p.b.)

Kerlinger, Fred N. Foundations of Behavioral Research. New York: Holt, Rinehart and Winston, Inc. 1964.

Kibler, Barker and Miles. Behavioral Objectives and Instruction. Allyn & Bacon, Boston. n.d.

Knoell, Dorothy M. People Who Need College: A Report on Students We Have Yet to Serve. American Association of Junior Colleges, One Dupont Circle, N.W., Washington, D.C. 20036. 1970. ($2.50 p.b.)

BIBLIOGRAPHY (continued)

Krathwohl, David R. The Taxonomy of Educational Objectives. Pittsburg: The University of Pittsburg Press, 1964

Krathwohl, D.R. & Masia, B. Taxonomy of Educational Objectives, Handbook II Affective Domain. New York: David McKay Co. Inc. 1964.

Lurie, Ellen. How to Change the Schools: A Parents' Action Handbook on How to Fight the System. New York: Random House, 1970.

Mager, Robert F. Preparing Instructional Objectives. Fearon Publisher/Lear Siegler, Inc. Education Division, 6 Davis Drive, Belmont, California 94002, 1968. ($2.00 p.b.)

Mager, Robert F. Developing Attitude Toward Learning. Fearon Publisher/Lear Siegler, Inc. Education Division, 6 Davis Drive Belmont California 94002, 1968. ($2.00 p.b.)

Mayhew, Lewis B. Innovation in Collegiate Instruction: Strategies for Change. Monograph Series #13 SREB Research Mon. by Lewis Mayhew Southern Regional Education Board/130 6th Street. N.W., Atlanta, Georgia 30313.

McAshan, H.H. Writing Behavioral Objectives. New York: Harper & Row, 1970.

McClelland, David C. The Achieving Society. D. Van Nostrand Co. Inc. Princeton, N.J. 120 Alexander Street, Princeton, 1961.

McKeachie, Wilbert J. New Developments in Teaching. New Dimensions in Higher Education. No. 16 Durham, N.C. Duke Univeristy, 1967, 110 pp. ERIC document Ed 013 341.

Medsker, Leland L. The Junior College-Progress & Prospect. 1960 McGraw-Hill Book Co. New York, 1970. ($7.95 h.c.)

Miller, Donald R.; Buckner, Allen L.; Carroll, Virginia L.; Rogers, Ted M.; Svenning, Lynne L.; Varney, Sheldon S.; Wehe, Richard A. A Manager's Guide to Objectives. California: Operation PEP (A State-wide Project to Prepare Educational Planners for California), 1969.

Moore, William Jr. Against the Odds: The High-Risk Student in the Community College. Jossey-Bass Inc., Publisher, 615 Mongomery Street, Higher Education Service, San Francisco 94111, 1970

Morris, William H. Effective College Teaching - The Quest for Relevance. American Association for Higher Education. One Dupont Circle, Washington, D.C. 20036, 1970 ($3.50 p.b.)

Needs Assessment. Tucson, Arizona: Educational Innovators Press, 1970.

Parker, Cecil J. & Rubin, Louis J. Process as Content-Curriculum Design and the Application of Knowledge. Rand McNally & Co. Chicago, 1966,68.

BIBLIOGRAPHY (continued)

Popham, W.J. "The Performance Test: A New Approach to the Assessment of Teaching Proficiency," The Journal of Teacher Education. 1968, pp. 216-222.

Performance and Process Objectives. Tucson, Arizona: Educational Innovators Press. 1970.

Plowman, Paul D. Behavioral Objectives: Teacher Success through Student Performance. Chicago: Science Research Associates. 1971.

Proposal Guidelines. Tucson, Arizona: Educational Innovators Press. 1970.

Raths, L.E. Values and Teaching. Columbus, Ohio: Charles E. Merrill Publishing Co., A Bell and Howell Company. Merill, Harmin Sidney B. Simon. 1966.

Rogers, Carl. Freedom to Learn. Columbus, Ohio: Charles E. Merrill Publishing Co., A Bell and Howell Co., 1300 Alum Creek Drive 43216. 1969. ($6.95 h.c.)

Roueche, John E. Salvage, Redirection, or Custody? Remedial Education in the Community College. American Association of Junior Colleges, ERICClearinghouse, 1315 16th St., N.W., Washington, D.C. #1 20036. 1968. ($2.00 p.b.)

Roueche, John E. & Boggs, John R. Junior College Institutional Research: The State of Art. A.A.J.C., ERIC Clearinghouse, 1315 16th St., N.W., Washington, D.C. 20036. 1968. Mon. #2.

Runkel, Philip; Harrison, Roger; Runkel, Margaret, Editors. The Changing College Classroom. Josey-Bass, Inc., 615 Montgomery St., San Francisco, Calif. 94111. 1969. ($9.50 h.c.)

A Scheme for Evaluation and An Organizational Structure of Variables. Tucson, Arizona: Educational Innovators Press. 1970.

Schwab, J.J. College Curriculum & Student Protest. The University of Chicago Press, 5750 Ellis Ave., Chicago, Ill. 60637. 1969. ($4.95 h.c.)

Short, Edmund C. & Marconnit, Goerge D. Contemporary Thought on Public School Curriculum. Dubuque, Iowa: William C. Brown Co. 1971.

Simon & Boyer. Mirrors for Behavior: An Anthology of Observation Instruments. School of Education, University of Massachusetts.

Skinner, B.F. The Technology of Teaching. Appleton-Century-Crofts Division of Meredith Co., 440 Park Ave. So., New York, N.Y. 10016. 1968. ($6.00 h.c.)

Stewart, Donald K. A Behavioral Learning Concept as Applied to Courses in Education and Training. Systems for Learning by Application of Technology to Education (SLATE), P.O. Box 456, Westminister, California 92683. Revised, 1969.

Stewart, Donald K. The Changing Role of the Educator: A Behavioral Learning Systems Approach to Instruction. ($8.00 h.c.)

Swan, Robert J., Editor. NVGA Current Career Information. Washington, D.C.: American Personnel and Guidance Association. 1970.

Thornton, James.W. The Community Junior College. 2nd Edition. John Wiley & Sons, Inc., 605 Third Avenue, New York, N.Y. 10016. 1960 & 1966. ($7.95 h.c.)

Tyler, Louise L. A Selected Guide to Curriculum Literature: An Annotated Bibliography. Washington, D.C.: National Education Association. 1970.

Tyler, Ralph W. Basic Principles of Curriculum and Instruction. Chicago: The University of Chicago Press. n.d.

Undergraduate report of teaching - Hazen Foundation. The Importance of Teaching: A Memorandum to the New College Teachers. C. Easton Rothwell, Chairman, Hazen Foundation, 500 Prospect St., New Haven, Connecticut 06511.

APPENDIX F

AVAILABILITY OF ESCOE PRODUCTS

Source information for the raw objective printouts and synthesized objective printouts as well as A Programmed Text for Writing Behavioral Objectives will be available in Massachusetts from:

Mr. Ronald Saris, Director
Research Coordinating Unit
Division of Occupational Education
State Department of Education
182 Tremont Street
Boston, Massachusetts 02111

and in New York from:

Mr. Walter Long, Director
ESCOE
Hudson Valley Community College
80 Vandenberg Avenue
Troy, New York 12180.

The final report and all separately bound appendices will be available through the ERIC System.

For information about the series of overhead transparencies developed by ESCOE, write to Mr. Long at the above address.